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# PUBLIC WORKS MINISTRY.

# REPORT

UPON THE

# ADMINISTRATION OF THE PUBLIC WORKS DEPARTMENT IN EGYPT

FOR 1903

BY 27132 77131

SIR WILLIAM GARSTIN, G.C.M.G., UNDER SECRETARY OF STATE, PUBLIC WORKS DEPARTMENT

WITH REPORTS BY THE OFFICERS IN CHARGE OF THE SEVERAL BRANCHES
OF THE ADMINISTRATION.



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## PUBLIC WORKS DEPARTMENT.

# ADMINISTRATION REPORT FOR THE YEAR 1903.

My note upon Public Works Administration in 1903, must, of necessity, be a very brief one. Owing to my absence in the Soudan and the preparation of my report upon the Upper Nile Basin, the time available for writing my annual note has been extremely limited. The reports furnished by the heads of the different services concerned are, however, so complete in themselves that very little in the way of observation is required from me. These reports consist of the following:—

## I .- The Irrigation Service.

(a) Report by Mr. A. L. Webb, C.M.G., Inspector General of Irrigation, Upper Egypt.

(b) Report by Mr. K. E. Verschoyle, C.M.G., Inspector General of Irrigation, Lower Egypt.

## II.—Services, other than Irrigation.

(c) Report by Mr. A. H. Perry, Director General of Towns and Buildings.

(d) Report by Captain H. G. Lyons, Director General of the Survey Department.

(e) Report by Mohamed Pasha Anis, Chief of the Technical Service.

(f) Report by Monsieur G. Maspéro, Director General of the Antiquities Department.

(9) Report by Mr. G. Gunn, Inspector for the Agricultural Railways to the Ministry of Public Works.

(h) Report by Captain Stanley Flower, Director of the Government Zoological Gardens.

#### EXPENDITURE.

The following tables show the total sums expended in 1903, under the Budget of the Ministry of Public Works:—

### TABLE I.

#### ORDINARY BUDGET.

						L.E.	М.
		162	272		200	48100	841
						618783	912
						213029	258
						-	352
	N. W. C.			200		The state of the s	531
		***	***	24.0	444	1000	829
 		***	***	***	***	14411	Gen
		Tota	al	449	LE.	941901	723
	. 000 000 8 000 000 0 000 000			 	 		48100 618783 213029 32485 15090

This total is greater by L.E. 7380.927 Mill., than that of the year 1902, the increase being chiefly due to expenditure in Survey Department.

#### TABLE II.

Extraordinary Budget, or Works executed under Special Credits.

Zifta Barrage (Caisse money)	98599 73313 479843 106076 46414	M. 079 807 845 440 403
Total L.E.	804247	574

This is less by L.E. 210738.250 Mill. than the expenditure, under the same head, in 1902. The decrease is due to the completion of the main expenditure upon the Zifta Weir and to a large reduction in the credits allowed for Public Buildings.

In addition to the expenditure shown in Table II, certain further sums were devoted to works not included in the above list, the credits for which were derived from various sources. This expenditure I have, as in last year's Report, grouped into a special Table, entitled "Various Extra Credits":—

#### TABLE III.

#### VARIOUS EXTRA CREDITS, 1903.

#### Caisse de la Dette money.

										L.E.	M.
Special	lo	w Nile	1000	460		 ***		***	2.22.	5488	969
Special	lo	w flood di	redit	544	***	 ***	***	***	***	2954	865
Rosetta	an	d Damiet	ta Sa	dds.	***	 ***	***		***	8237	266
The second secon		atalogue		***		 244	***	***	***	2601	105
Temple		Karnak.		***	***	 ***	***	***	-0.0.0	2374	303
55		Philæ	***	***	***	 ***	***	598	***	318	728 731
11	27	Edfu	***	***	***	 ***	388	177		1100	TOL
						Tota	al	***	L.I	23143	967

## Money supplied by other Departments and Revenue.

Survey (revenue)	l ma	inte	nane	e)	***	***	30257 1055 9087 263 1 2414	470
Public Buildings (revenue)	***					3	and and all and	166

The expenditure in this table is less than that for the year 1902, by L.E. 27055.157 Mill. The reduction is chiefly due to the reduced expenditure upon the Nile flood, and the completion of the repairs to the Phila Temples.

The following table gives a summary of the year's expenditure:-

#### TABLE IV.

## TOTAL EXPENDITURE IN 1903. Tables I. II. III.

Ordinary Budget Extraordinary Budget Various Extra Credits (1)	***	***	***	***	***	400	***	941901 804247 66254	723 574 133
				Tota	ıl	***	L.E.	1812403	430
(*)—Irrigation	***		. 1		**	17736 11797 30257 6461	69 7 00	0 6 0	133

The above total is less than that of 1902, by L.E. 230412.510 Mill. The payments made in 1902, to Sir John Aird and Co. for works connected with the Nile reservoirs, amounted to Pounds Sterling £50767 or L.E. 49497.825 Mill.

Adding this last sum to the figure given in Table IV, the total expenditure controlled by the Department of Public Works in 1903, was L.E. 1861901.255 Mill.

This is less than the total expenditure for 1902, by L.E.523131.885Mill.

This diminution is due to the fact that last year, the Reservoir works were practically completed.

I will now describe the progress made by the General Services in 1903, separating my Report into two portions, viz, "Irrigation Works," and "Works other than Irrigation."

## Part I.—IRRIGATION WORKS IN 1903.

## THE SEASON AND THE WATER SUPPLY.

In consequence of the effect upon the river, below the Aswan Dam, caused by the filling and discharging of the Reservoir, the gauge at Aswan can no longer be made use of during the summer months as a standard of comparison with the river levels of previous years. In future, the gauges at Khartum and at Wadi Halfa will be referred to in any comparative statements of the kind.

The years 1900, 1901 and 1902, were distinguished by abnormally low summer levels, followed, in each case, by a partial failure of the flood. At the commencement of last year, it appeared probable that 1903 too would be included in the same category as its immediate predecessors, namely as a year of bad supply. On the 1st of January, the level at Khartum was only 26 centimetres higher than that recorded on the same date in the years 1900 and 1902, and was 10 centimetres lower than the reading in 1901. At Wadi Halfa, the water levels were not much better. Although the gauge reading on the 1st of January 1903, was 86 centimetres higher than that of the 1st January 1900, it was only 4 centimetres above that for the same date in 1901, and only 12 centimetres higher than the level recorded in 1902. Consequently, the year 1903 commenced with a river level considerably below the normal. For several months the conditions continued to be unfavourable, going from bad to worse, until on the 17th of May, the Khartum gauge recorded a reading 10 centimetres lower than the lowest level reached in the minimum year of 1900.

Fortunately, from this date matters began to improve, and a steady rise commenced. This was continued until, on the 29th of May, the level for the same date in 1899 (a year of fair summer supply but of poor flood) was passed. On the 18th of June, a check occurred in the rise which was followed by a slight fall. On the 1st July, the true rise commenced at Khartum.

The flood, however, during the earlier stages, was extremely slow in rising; so much so that, during the first half of the month of August, everything appeared to point to a failure of the Nile flood for the fifth year in succession. By the 15th of August, a great improvement took place and, by the end of that month, the levels at Wadi Halfa were those of a fairly average year. The fall, after this date, was a gradual one and, by the end of 1903, the gauge at Halfa was nearly 40 centimetres higher than that for the last days of the year 1902.

The year 1903 may be briefly described thus: Throughout the winter and early summer months, the levels were exceptionally bad, but a timely rise in the middle of June improved matters considerably. In the first stages of the flood, the water levels were much below the mean of previous years, but, towards the end of August, they rose so quickly that those of a fairly average year were attained. The flood, however, must be classed as a late one. The fall was so gradual that the year closed with a better prospect for the supply of the following summer, than had been the case for several years previous.

The maximum gauge reading at Khartum in 1903, was reached on the 31st of July, and at Wadi Halfa on the 25th and 26th of August, when 8.20 was recorded on the gauge.

# ASSISTANCE RENDERED BY THE ASWAN RESERVOIR.

Throughout the period of low summer supply and, whilst the Khartum levels were at their lowest, the discharge of the river, north of Aswan, was supplemented by the water from the Reservoir, to such an extent that no difficulties, as regards irrigation, were experienced, and but few people in Egypt were aware of how critical at one time the situation promised to become. By the 1st February 1903, the maximum water level, viz R.L. 106.00, was reached in the Reservoir. From that date, until the 10th of March, it was kept full and the river supply was passed through the upper sluices. On the 10th of March, in consequence of the low levels of the river, it was decided to commence supplementing the discharge, by the water stored in the Reservoir.

The following cubes of water discharged and added to the river supply:—

By the end of June, the first rise from the south reached Aswan, and thus maintained the river levels downstream of the dam. Previous to this date they had been artificially kept up by the water from the Reservoir. The discharge of the Nile in June, was only some 20 millions of cubic metres per diem. The Reservoir water therefore practically doubled the available supply, at the most critical period for

the irrigation of the summer crops.

The filling and discharging of the Reservoir involves an immense amount of work in the shape of calculation, diagrams, etc., besides constant watching of the river levels and very careful manipulation of the sluices of the dam. Considering that the year 1963 was the first in which the Reservoir was made use of, and that there had been no previous experience to guide them, great credit is due to Mr. Webb, the Inspector General of Irrigation, Mr. May, the Resident Engineer and the whole staff, for their very successful regulation of the With the abnormally low levels and the totally inadequate supply in the river up to the middle of May, there would have been great difficulty in saving the summer crops, had it not been for the assistance afforded by the water stored in the Reservoir. This enabled an ample supply to be given to Middle and Lower Egypt, at least one month earlier than would have been possible had the dam not existed. Canal rotations were relaxed generally early in July, instead of in the middle of August. The prohibition against the irrigation of land for the maize sowings was removed one month earlier than the usual date. Rice irrigation was permitted everywhere and the entire cotton crop was plentifully watered. Lastly, some 170000 feddans of land in Middle Egypt, formerly basin, were given "Sefi" irrigation. The rental and sale value of these lands was consequently largely increased.

Measures taken in 1903, to ensure Water distribution.

The Asynt Barrage was closed on the 21st of February. The maximum "head" attained on this structure was 1.11 metres. It

was fully opened by the 9th of August.

The Delta Barrages were tightly closed by the 10th of April. Up to the first week in June, the supply in the river, upstream of these structures, slowly diminished. After that date, the influence of the Reservoir water was felt and the supply steadily increased. By the 3rd of July, the level of 15.50 metres upstream was reached. This is an all-important level, as regards Lower Egypt, as, until it is reached,

no water is passed down the branches of the river below. It is the maximum level permitted, with all the gates closed. In previous years this maximum has rarely been attained until a month later and it has often been as late as the middle of Angust. The effect of the Reservoir, combined, it is only fair to add, with an early rise in the south, was to reduce the period of tension to some 38 days, as against from 70 to 110 days in previous years of similar supply.

The earthen "sudd" in the Damietta branch was not constructed in 1903. That in the Rosetta branch, was made as usual. This "sudd" was completed by the 20th of May. A total quantity of 80 millions of cubic metres of water was drawn from the pool upstream of this dam. This was sufficient to give two waterings to an area of some 100000 fedduns.

The Atfeh pumps were worked for a total period of 22 days. These pumps are used to supplement the supply of the Mahmudiyeh canal.

Summer rotations were commenced in Lower Egypt, on the 15th of

May. They were removed everywhere, by the 21st July.

Flood rotations, by which alternate periods of high and low supply are given to every reach of the canals, were enforced from the month of August. These rotations have an excellent effect in preventing the flooding of the drains and the consequent swamping of the adjoining lands.

## IRRIGATION EXPENDITURE IN 1903.

#### TABLE L

#### ORDINARY BUDGET.

Central Office (including supplementations)	*** *** *** *** ***	. 76769 . 209328 . 332686	8. 057 755 100
	Total I	L.E. 618783	912
	LE II.		
Ziftah Barrage (Caisse). Drainage Works (Caisse) Irrigation improvements (Caisse) New Weirs (Caisse)		73313	807 807 815
	Total	L.E. 651756	7:31

#### TABLE III.

## VARIOUS SPECIAL CREDITS.

							L.E.	M.	
Special Low Nile Works (	Chisse)			44.5			5488	969	
Special Low Flood credit							2954	865	
Rosetta & Damietta "sudds"	40						8237	266	
Barrage Gardens	75	446		***		0.01	1055	470	
	1-		Tot	o l		Ŧ.	E. 17736	570	
			7416	403000	C 0 D	444	221 2. 1 1 1 1 1 1 1		

The figures in these three tables, added together, give the total expenditure upon Irrigation Works for the year.

#### TABLE IV.

#### TOTAL EXPENDITURE, 1903.

Ordinary Budget Extraordinary Budget Various special credits		 	 	 618783 651756 17736	912 731
<u>r</u>				.1288277	

This is less than the expenditure, under the same heads in 1902, by L.E. 154835.670 Mill.

The foregoing may be subdivided as follows:-

#### TABLE V.

							La. Bi.	201 -
(a) Regular Budget	1	0 0 0					201060	579
		444				4 8 4	249999	199
(e) Corvee Relief (Finance).				* * *			150596	827
(d) Agricultural Honds		0 0 0	407	2 4 5	* * *	* * *	12753	236
(e) Special credit for Bridges	tor						4401	161
			To	tal	1 = 1	LE	. 618783	912

(a) The item "Regular Budget" in Table V, is again subdivided thus:—

TABLE VI.

					I.F.	M.
Establishment		 	100		80211	844
Contingent charges		4 9 5	4 0 0	***	20500	597
New Works	0.0			***	19508	981
Maintenance and Repairs					50416 450	493
Khatatheh and Atfeh Pumps	0.00	 ***		200	10000	000
Drainage of Lake Marcotis					1201	SH 13
Supplementary Reservoir expenditus	Pia				15261	761
Etsa Pumping Station		 		***	3500	116.91.3
					201060	579

The total of this last table is very similar to that of 1902.

# (b & c) TABLE V.—Corvée Relief.

These items call for but few remarks. The distribution of the credit furnished by the Caisse was the same as that of 1902. The credit supplied by the Ministry of Finance was, as usual, distributed according to the necessities of the different provinces and irrigation circles, in which Corvée relief works were executed. The following table shows a subdivision of the Corvée expenditure.

TABLE VII.
CORVÉE ABOLITION.

Corvee Abolition	Upper Egypt.	Lower Egypt.	Total.
	L.E. W.	1E. M.	L.E. M.
Caisse money 1902	128000 000 128000 000		249999 370 249999 119
Regular Budget   1902 1903	30302 713 31357 359		150808 188 150569 827
Total L.E. 1902	158302 718 159357 539		400807 558 400568 946

# (d) TABLE V.—AGRICULTURAL ROADS.

The following shows the work done and the expenditure incurred:-

LOCALITY.	Length of rauls existing previous to limit.	Longth of new roads constructed in 1963.	Exponditu in 1903.	
Upper Egypt and the Fayum	638. 1800.40	Kilometres.  — (land) 63 · l(x)	3 12749	56. 479 747
Totals	2438 • 40	63 *100	12753	226

The apparently excessive expenditure in Lower Egypt, is almost entirely due to the payment of bills for land taken up in the year

previous, but unpaid for, owing to delay in the preparation of the registers.

## (e) TABLE V.—BRIDGES TO REPLACE FERRIES.

The total expenditure under the Caisse grant in 1903, was L.E. 4401,161 Mill.

For this money, four bridges were put in hand, two in Upper and two in Lower Egypt. Of these, three were completed and the fourth is under construction.

In Behera Province, an iron bridge was commenced at Khatatbeh to replace an old bridge. L.E. 1000 was expended upon this work in 1902, but it will require a further sum of L.E. 1600 to complete it.

In the Girga Province, 19 timber bridges, on masonry abutments and piers, were built at a cost of L.E. 9420. These bridges were paid for by the landowners themselves, a tax having been imposed (voluntarily) upon the cultivated area of the Province in order to find the funds required.

Out of the 49 bridges voted by the Provincial Girga Councils, 33 have been completed up to the end of 1902.

## THE ZIFTA BARRAGE.

This work was completed early in 1903, and inaugurated by His Highness the Khedive in the month of March. The subsidiary canals, taking off right and left of the river above this work, were not sufficiently advanced to enable full advantage to be taken of the Barrage during the summer months. Nevertheless, it played a useful part at a very critical moment. It was regulated upon throughout the summer, and yielded small supplies to the Rayyah Abbas for short intervals during the rotation periods. The great service rendered by this work, however, was during the important time when the flood was first rising. The effect of this first rise is generally very slowly felt, and, as every feddan of land in the upper reaches of the canals is taking water at that moment, the tracts to the north, particularly in northern Gharbieh, suffer severely by the delay in the arrival of the extra supply. In 1903, water was passed down the Damietta branch, between the 3rd of July and the 14th of August, in sufficient quantity to enable the Rayvah Abbas, by means of the Zifta Barrage, to feed the Bahr Shebin. The water taken from the river upstream of the Delta Barrage, warthus used for the irrigation of the southern area of the Delta, while the northern tracts derived their supplies from the Zifta weir. The effect was to increase the water supply of the 2nd Circle of Irrigation by 30 per cent during the latter half of July, and throughout August. This permitted the early abandonment of the rotations, and largely assisted the sowing of maize and rice.

## "SHARAKI" IN 1903.

The area left unirrigated was a small one. The final returns have not yet been received, but it is not expected that the total will exceed 5000 feddans, all of which is upon islands, or on high foreshores of the river.

#### CROPS.

The winter crops, both in Upper and Lower Egypt, were generally good.

A very large area was planted with cotton in 1903, and at one time, a record crop appeared probable. There was no shortness of water, but, unfortunately, the same unfavourable climatic conditions were reproduced, which had reduced the yield for several years in succession. These conditions were, a low temperature and fogs during the month of September. In spite of this, the crop was a fairly good one and the latest estimates give the probable out-turn as 6500000 kantars. The price, throughout the season, was exceptionally high.

The maize crop, although affected by the cool weather was a plentiful one.

The cultivation of rice was practically unrestricted, and a very large area was planted with this crop.

The final returns from the sugar Factories in Upper Egypt are not yet to hand, but the sugar-cane crop is reported to have been an average one.

With regard to this last crop, it must not be forgotten that, at present prices and even with a considerable reduction, cotton is far more profitable to the landowner than sugar. Unless then there should be a ruinous fall in the price of cotton, an increase in the area of this crop may be expected in the tracts formerly devoted to sugar-cane, and a corresponding decrease in the area planted with the last-named crop.

## THE RISE IN THE VALUE OF LAND IN MIDDLE EGYPT.

Throughout Egypt, there has been a very marked increase in the sale value of all land, but in Middle Egypt, this rise has been especially apparent, in consequence of the increased rental obtainable for land converted from basin to perennial irrigation. This result, although highly satisfactory to the land-owner, is scarcely so much so to the Government, as it has produced a very serious addition to the cost of the conversion works.

The construction of the new canals and drains has necessitated the purchase of considerable areas of land by the Government. These works have been carried out in each province in succession, commencing with Asyut. Thus, when the conversion of one province was completed, work was commenced in that next to it and to the north of it. The Province of Asyut was first taken in hand as being the nearest to the head of the Ibrahimieh Canal, which takes off above the new Asyut Weir. When Asyut was completed, work was started in the Minieh Province, and after Minieh, will come Beni-Suef, and last of all Ghizeh.

The results obtained by the conversion works in Asynt were so satisfactory, as regards the yield of crop, etc., that the landowners in the Province of Minieh auxiously awaited their turn for reaping similar benefits. As soon as it was known that the works were to be commenced, the value of land in Minich rose throughout the district. As this enhanced rate applied to the land required for the new canals, etc., equally with all other land in the province, the Government found itself in the anomalous position of being obliged to spend considerably more money upon the construction of the very works to which this increased value of the land was due, than would have been the case, did these works produce no benefits to the landowners whatever. In other words, the Government, by spending large sums. increases the productiveness of the land. The proprietors, well aware of this, and equally well aware that land for the necessary works must be purchased from them, demand a rate for it, based upon its prospective value when these works shall have been completed. Thus, those who will eventually reap the benefits, make their benefactor pay heavily for the privilege of bestowing such benefits upon them! Such a result could scarcely be arrived at in any other country than Egypt.

The only remedy would appear to be the suspension of these works, until an arrangement could be come to with the landowners that they

should give the area of land required at a reasonable rate. Such a suspension is undesirable, as it would defer the realisation of the increased revenue to be obtained from the conversion of the basins, and the people are well aware that it is not likely to be put in force.

The following figures show the cost of the conversion works (per feddan benefitted), as executed, compared with the original estimates:—

I.—Asynt Province:	<u>[]3</u>	М.	
Original estimate	 2	005 per 233	feddan.
II.—Minich Province:			
Original estimate		153 556	**
III.—Beni Suef and Ghizeh Provinces:			
Original estimate	 4	6 16 36 3	92

As the work in these last is in progress, the actual cost is not yet known.

It will be observed that, warned by the excess in the cost of construction in No. I, when the estimates for No. II were framed, a considerably increased rate was allowed for. Even this was insufficient, and for No. IV the original rate per feddan (for Asyut) has been doubled in the estimates!

Although the price of land is chiefly responsible for the enhanced cost of the works, it is only fair to state that increase is not entirely due to this cause. Owing to the expansion of "Sefi" cultivation in Middle Egypt, labour is now more difficult to obtain, and costs more than was formerly the case. It is now difficult to obtain ordinary labour for less than P.E. 5 per diem, whereas, a year or two ago, it could be easily got for a rate of P.E. 3 per diem. This has naturally produced a corresponding increase in the cost of all classes of works.

In the figures given above, representing the cost of the conversion works, per feddan of land benefitted, the expenditure upon the widening of the Ibrahimia Canal (the main supply channel for Middle Egypt) and the remodelling of the main drain with its pumping stations upon the Nile, has not been included.

If the figures for these works be added to the estimate, then the total cost of conversion, for the 451,000 feddans of basin in the four provinces, will come to L.E. 3,200,000, or some L.E. 7 per feddan of land converted. It will thus be seen that the process of conversion is

a costly one, and it may well be asked whether such an expenditure is warranted.

The results obtained, so far as they go, give a satisfactory reply to such a question.

Up to the end of 1903, some 170,000 feddans of basin land have been converted to perennial irrigation. Assuming the total, final cost, as distributed over the whole area, to be L.E. 7 per feddan, the proportional expenditure, for the area already converted, will be L.E. 1,190,000.

The gain to the landowner has been, that his annual rentals have increased by at least L.E. 3 per feddan, and the sale value of his land has risen by at least, L.E. 40 per feddan. In other words, for an expenditure of L.E.1,190,000, the annual rental of 170,000 feddans, has been increased by L.E.510,000, and the present sale value, by a sum of L.E. 5,100,000.

The gain to the Government will lie in the special rate of P.E. 50 per feddan, which will be levied on the converted lands, in a few years' time. When this rate falls due, the Government, on the area of 170,000 feddans will receive an additional annual revenue amounting to L.E.85000.

Before these works were undertaken, it was feared that the cultivators of Middle Egypt, having been accustomed to basin irrigation for many centuries, would be slow in adapting themselves to the new conditions. The contrary has been the case. Although short of cattle for agricultural purposes, the readiness with which they have availed themselves of the "Sefi" water, has been very satisfactory.

## THE MEX PUMPS.

The cube of water raised, by these pumps, from Lake Mareotis, and passed into the sea at Mex. was, in the winter of 1902-1903, =346,420,022 metres. This amount is the maximum as yet recorded in any one season's work. It is greater than that lifted in the previous year, by some 11,000,000 cubic metres. The increase is due to the heavy rainfall on the sea-coast in the winter of 1902-1903. The cost of pumping last season fell to a rate of L.E. 32.205 per cubic metre of water lifted, as against L.E. 34.548 for the year before. In spite of this satisfactory result, which is due to good management, the total charge for pumping in 1903 was over L.E. 13000. This is a very heavy charge upon the Irrigation Budget.

## NEW WORKS AND REPAIRS IN 1903.

## (a) UPPER EGYPT.

PROVINCES OF ASYUT, MINIER AND BENI SUEF.

The following were the chief items of expenditure :-

Works connected with the conversion of the basins. The total cost in 1903, was L.E. 399000.

For this sum, 733 kilometres of canals and drains were constructed. The works included 386 masonry works and nearly 12 millions of metres cube of earthwork.

#### THE FAYUM PROVINCE.

Some L.E. 65000 was spent upon remodelling works (canals and drains) connected with the Reservoir. This represents construction of channels for a length of 194 kilometres.

In addition to the above, 14 miscellaneous new masonry works were constructed, and 69 others were repaired, at a cost of nearly L.E.19000.

7.6 millions of cubic metres of earthwork were executed for a sum of L.E. 100000.

## THE ASWAN RESERVOIR.

The final certificate, amounting to £3,320,272, was paid to Messrs. Aird & Co., the contractors, on the 4th of April 1903, in settlement of all acounts.

This is thus divided :-

Cost of the Aswan Dam Asyut Barrage	***	***	***	***	***	402	P 0 0	2,424,797 895,475
				T	otal	E ***	*11	£3,320,272

## NEW LOCK SOUTH OF ASWAN DAM.

In order to assist navigation between the dam and the town of Aswan, it was found necessary to construct a new lock, (making the fifth in the series) at the Sahel cataract. This work, which was commenced in the winter of 1903 was successfully completed before the flood of that year. The cost was L.E.49382.

#### (6) LOWER EGYPT.

The following, were the principal works carried out in 1903.

A sum of L.E.179000 was expended upon new works in connection with irrigation improvements.

The chief heads of expenditure are as follows:-

The Zifta Barrage, the Ismailia Canal head and lock, the Nagail Canal project, the Kasheb Canal project and sundry large regulators.

#### THE ZIFTA BARRAGE.

The completion of this work has entailed a total expenditure of L.E.420079.

The amount is thus subdivided:-

							L.F.
The Barrage proper			***	 	***	***	286120
The Rayyah Ablas				 			99035
The Mansuria canal head	* * *	0.00		 		0 + 0	34924
				Total			L.E. 420079

Of the above, L.E. 89839 was expended in 1903.

## THE ISMAILIA CANAL HEAD AND LOCK.

This work was completed in 1903, at a total cost of L.E.62416. Through navigation between the Nile, the Ismailia Canal and the Suez Branch has thus been re-established.

#### THE NAGAIL CANAL PROJECT.

This is an important scheme for improving flood irrigation in the Province of Menufia. The total expenditure up to date has been some L.E.24000, of which L.E.11000 was expended in 1903.

#### THE KASHEB CANAL PROJECT.

L.E. 6800 was spent upon remodelling this, the main irrigation channel for 40000 feddans in the Ghizeh Province, on the east bank of the river.

#### REMODELLING SUNDRY LARGE REGULATORS.

The works put in hand in 1903, were the regulators of Bugaria, Sirsawia, Basiun and Qodaba. All these are important works. The expenditure was L.E.5500.

In addition to the above expenditure, a large number of remodelling works, for the improvement of water distribution, were carried out in every province in Lower Egypt.

137 kilometres of new channel were constructed, and some 8½ millions of metres cube of earthwork were executed. This last item represents

an expenditure of L.E.179000.

## DRAINAGE WORKS IN LOWER EGYPT.

165 kilometres of new drains were constructed in 1903 at a cost of L.E.83552.

This sum includes the cost of several very large masonry works in the shape of drainage syphons, etc.

#### SPECIAL CREDITS FOR LOW NILE.

T	140	foll	owing	Was	the	exnent	liture:-
A. 1	111	7/1/1	CLAS THIS	24 15-	CERC	F. 78 136:576	ALCELLA C.

							LOW NILE	Low Fra	COO
							tras. M.	L.E.	м.
Upper Egypt. Lower Egypt.				***			Nil	1577 (	366
Lower Egypt.							5488 969	1319 9	103
Central Office	b 0 0		* * *	***	* 4 0	840	Nil	57 :	296
		,	l'otal:	5.01	000	$I_{d}$	E. 5488 969	2954 3	565

## RIVER PROTECTION.

Expenditure	in	Upper Lower	Egypt Egypt	202	0.0	 ***	***	***	444	****	3479 27821
										_	1.31300

## BASIN BANK PROTECTION.

On revetment works, a sum of L.E. 5968 was expended in 1903.

## THE NILE CORVÉE IN 1903.

The following are the figures :-

LOCALITY			NUMBER MEN FOR 101 DAYS
Upper Egypt	100 000	***	10703 541
	Total	- d p	11244 men for 100 days

In both localities, the numbers are very much less than for previous

years of similar flood levels.

Mr. Verschoyle, the Inspector General of Irrigation for Lower Egypt, is of opinion that the policy of reducing flood watchmen in the Rosetta and Damietta branches of the Nile, and in Ghizeh, has been rather overdone during the past few years. The banks, which have been deprived of their protection of stakes and brushwood, have sufferred from wave-action. This will entail a considerable expenditure in repairs.

## THE "SUDD" IN THE BAHR-EL-GEBEL.

No work was done, as regards the clearance of this obstruction, during the winter months of 1902-1903. In the latter part of 1903, however, an expedition under Lt. Drury, R.N., attached to the Soudan Service, started with the object of completing this work. Unfortunately, his serious illness at the moment when the work was well advanced prevented its completion.

## EXPEDITION TO STUDY THE NILE SOURCES.

In December 1903, two expeditions started for the above purpose. The one visited Lake Tsana, the source of the Blue Nile, and the other the Lakes Victoria, Albert Edward and Albert, which, with the Solat and the Bahr-El-Ghazal, constitute the sources of the White Nile. Both missions returned to Egypt in the spring of 1903, and the Reports will be published early in 1904.

## NILE GAUGES IN THE SOUDAN.

The following new ganges were erected in 1903:-

White Nile.

Gondokoro, Mongalla, Taufikia and Ghaba Shambé.

Sobat.

Nasser and Doleib Hilla.

Atbura.

Khashem-El-Girba.

## LAKE VICTORIA NYANZA GAUGE READINGS.

The rains at the end of 1902, in the neighbourhood of Lake Victoria, were heavier than in 1901. The lake level began to rise in December 1902 and continued to rise until July 1903. It then fell until October, when a fresh rise commenced. According to the latest information, this last rise has been continued. Unless the rains in April and May 1904, should fail, the mean level of the lake will probably be higher in 1904 than has been the case for several years past.

After the almost continuous fall in the mean level of Lake Victoria from 1896 (when regular readings commenced) until 1902, the present year has seen a marked improvement. The following table, compiled by Captain Lyons, Director General of the Survey Department, shows the variation in the mean level of the lake, deduced from the gauge readings, as corrected by him.

Mean lake levels in metres.

SITE				Ye	ars.			
	1896	1897	1898	1899	1900	1901	1902	1903
Kisumu	0.428	-	-	0.727	(1:301)	o-Jas	0.172	0.731

The readings for 1897 and 1898, for Kisumu, are incomplete. These figures show that in 1903, in the seventh year after the series of six low years, the lake level has risen again.

## THE STAFF IN 1903.

The Irrigation Service suffered a loss in the retirement of Major Sir Hanbury Brown, in April of last year. For nearly twenty years he devoted his services to the improvement of irrigation in Egypt, and numerous works testify to his labours in this direction. Among the more important may be mentioned the restoration of the Delta Barrage, with its subsidiary weirs, and the Zifta barrage, the last work being completed shortly before he left the country.

His knowledge and experience of irrigation were exceptional.

On Major Brown's retirement, Mr. A. L. Webb became Inspector General of Irrigation in Upper Egypt and Mr. K. Verschoyle was appointed to the similar post in Lower Egypt. Owing to the completion of the Nile reservoir works, the post of Inspector General of Reservoirs was abolished.

The entire staff worked hard and well and a very successful year

bears witness to their labours.

The two Inspectors General of Irrigation, Messrs. Webb and Verschoyle, need no words of praise from me. The good results obtained last year are entirely due to their labours and to those of the Inspectors of the different irrigation circles, who again were ably seconded by a very competent staff.

## Part II.-WORKS OTHER THAN IRRIGATION.

## L.—THE TOWNS AND BUILDINGS SERVICE.

The following tables show the sums expended by the above service during the year 1903. They are merely an amplification of the details of the total expenditure, as recorded upon pages 4-6 of this Report.

The following was the general distribution:-

(a) Ordinary Budget (b) Special funds granted by Caisse (c) Special funds from other Departments (d) Special works under revenue	4.0.5	***	213029 106076 46414 11797	
Total		J1	E. 377317	797

This total shows an decrease in expenditure over that of 1902 amounting to L.E. 81840.726 Mill.

The four items in the first table are thus subdivided:-

## (a) ORDINARY BUDGET.

(1) General Direction								La R.	M.
(2) Public Buildings	150	0 1 4	***	-		0 4 4		22150	771
(3) Cairo City		* = =						85565	650
(4) Provincial Towns		0.0.0	9 0 0			0.04		33237	741
(5) (100		* * *	4 = 0	* * *		P & 4	* = =	48385	000
(6) Esbekich Gardens	***	***	0 T 0		0.86	204		21301	927
(9) against tell Cittle Hells		0.00		* * *			> 0 0	2388	169
				Tota	l		I.	E. 213029	258

The total is more than that for 1902 by L.E. 2114.924 Mill. I will briefly discuss the different items:—

## (1) General Direction.

This calls for no special remark. The sum represents the salaries of the permanent staff and is more than that expended in 1902 by L.E. 444.446 Mill.

## (2) Public Buildings

# The following is the distribution of expenditure:-

					L.B.	М.
Temperary staff	 		111		 1 10 21	000
General charges					4367	
Materials and plant					No. of Cont.	
New works					8215	
Repairs and maintenance					71242	OOD
•		Tat	n.l		L.E. 85565	650
		T CIT	******	400	1.10 2.30	

Or, more than the expenditure in the previous year by L.E. 7285.288 Mill.

## (3) Cairo City.

							124.	M.
Temperary staff		 	400		0 1 0	441	736	63(36)
General charges	2 4 4	 	4 6 0				839	1455
Plant and materials							1139 7336	508
Transport of materials							3488	554
New works Remirs and maintenance							19697	799
Helmia and mantenance.	500							
			Tota	I		1 3.	E. 32237	741

## (4) Provincial Towns (Local Commissions.)

						Leads.	51.
Temporary stuff			 		 	642	(100
	***					927	889
Materials and plant							434363
New works						198	736
Repairs and maintenant	949	,	 			46611	375
itt falls with illimited with	. (						
			Tot	n1		L.E. 48385	DOO

The sums in the above table are expended by the local Committees of the provincial towns. These, again, are controlled by a permanent Superior Commission at Cairo, which examines all proposed expenditure, exceeding a certain fixed amount.

## (5) Lighting.

#### (a) Gas.

The total number of gas lamps, in Cairo, at the end of 1902, was 3500; no addition was made to this number in 1903;—6500 more lamps are urgently required in the native quarters of the city. This would entail an expenditure of L.E. 43800.

The fines levied against the Gas Company for defective light have decreased by some 50%. This is largely due to the better quality of the

gas supplied.

The Gas Laboratory, under the Public Works Chemist, was opened in April 1903, and tests to control the illuminating power, the purity and the pressure of the gas supplied by the Company, were commenced on the 4th May of last year.

In accordance with the agreement made, the Gas Company has commenced the installation of "incandescent" burners, at its own expense, to replace the old " flat-flame" burners. Up to date, 500 lamps have been fitted with the new burners. The result is very satisfactory and is a great advance on the old system.

## (h) Electricity.

7740 metres of new cable were laid in Cairo during 1903. 53600 incandescent lamps of 10 candles power were put up.

The towns of Helwan, Ismailia and Mansura are now lighted by

electricity.

Rules and regulations governing all electric installations have been drawn up and will shortly be published.

## (6) The Esbekieh Gardens.

In 1903, the receipts were L.E. 1263.382 Mill, while the expenditure was L.E. 2388,169 Mill.

## (b) Expenditure under Special Credits granted BY THE CAISSE DE LA DETTE.

\$* Et							L.E.	M.
New Egyptological Museum	0 0 0	4 8 4					16399	265
Clearing front of above		4			444	***	938	213
Asphalt paving Chiro streets		4 = 4		0.00			14099	483
Repairs to ancient monument	di.	4 0 1					28113	436
Sundry new buildings		4 0 0	***		4 0 0	0.00	71747	013

Total... L.E. 106076 440

# (a) LIST OF WORKS EXECUTED UNDER SPECIAL FUNDS PROVIDED BY OTHER DEPARTMENTS.

							L.E.	b6 .
Delingat Markaz						100	1796	299
El-Atf Markaz				***			538	783
Zagazig Mudiriyeh				4 4 4	100		652	614
Fleming Police Station	440		122	*11			2093	112
Polytechnic School				***		000	9999	266
Arabic Museum furniture	24.0		1 = 4				2288	333
Agricultural School							252	622
Favum Tribumal					***		1423	857
Aswan Tribunal		***					1)-)-)	221
Ras-el-Tin Palace						***	11685	33.00
Ras-cl-Tin School							3000	OOU
Tahta Tribunal		100					640	(100)
Sundry small buildings			***				fifti	033
Achievement Arabic Museum		100				* * 5	4682	535
Cairo Girls' School		* * *					789	441
Molamed-Aly School	100		***		***		641	381
Mansura School							575	386
Opera House				200	***		562	901
Fire-engine room at Girga						004	534	1135
Bulae Printing Office						0 0 0	468	585
Land for Mansura Tribunal							411	(HIC)
Repairs to Polytechnic School		110			***		367	860
Cemeteries in provinces					***		360	610
Kasr-el-Nuzha School				100			360	(30)(3
Fire-engine rooms		***	4.00		***		270	264
Transport of Giza Palace roof		Abile				000	2(11)	(3()()
Works under L.E. 200			0 * *				259	261
11.11.11.11.11.11.11.11.11.11.11.11.11.			and a					100
			Tot	al		14.1	E. 46414	403

# (d) Special Works coming under the head of "Revenue."

Provincial Towns	Cairo City Public Building Revenue	* * *	 + 0.0	* * * *	 		(n)87 2414	
					 	* * *		

## NEW WORKS.

No works of any very special magnitude were under construction in 1903.

21 different buildings were completed in different parts of Egypt, consisting of schools, courts of justice, Police barracks, Government offices, etc.

The total cost of the above has been L.E. 96638, of which L.E. 50114 was expended in 1903.

In addition to the above, 10 other works of the same nature were under construction during the year and are not yet completed. The expenditure for the year was L.E. 21495.

#### REPAIRS.

A sum of L.F. 45401 was spent upon the repairs, small and great, of 567 Government buildings. Of these charges the heaviest was the roofing of the Ras-el-Tin Palace, upon which a sum of L.E. 14500 was expended in 1903.

## THE CAIRO ROADS.

A sum of L.E. 12229 was spent in 1903 upon the upkeep of 490950 square metres of road. This area represents only 17% of the total road surface of Cairo.

In addition to this L.E. 17305 was expended upon the construction of asphalt roads in the native quarters of the city. The experiment has been entirely successful, and is to be continued in 1904, another grant of L.E. 20000 having been accorded for this purpose by the Commissionners of the Public Debt.

## TELEPHONES.

Telephonic communication between Cairo and Alexandria was opened in May 1903.

# THE CAIRO TRAMWAYS.

The new line to Shubra, a length of 4868 metres, was opened for truffic last year.

The number of people using these means of communication is steadily increasing as the following table shows:—

YEAR 1901								op	PASS	NUMBER ENGERS FOR THE YEAR.
1902		» q o	* * *	* * *			 101			14714667
1903	* = =	0.04	* 4.4		0 0 4	* * 1	 	* * *	100	16926050
14116)	944	404	* * *	***	. 4		 ***	***	440	18957167

# NEW BRIDGE ACROSS THE NILE AT CAIRO.

Tenders have been invited for the construction of this bridge. It will cross the Nile at Roda Island, and the length of the roadway will be 535 metres. The tenders will include offers for the construction

of two smaller bridges across the Roda channel. Enquiries regarding specifications, etc., have been received from well known firms in England, France, America, Germany, Belgium and Switzerland. The latest date upon which tenders will be received is the 1st of February 1904.

#### WATER SUPPLY OF PROVINCIAL TOWNS.

Small water-works exist in 14 towns, not including the more important installation at Tanta. Installations upon a larger scale are projected at Zagazig, Mansura, Menuf, Shebin-el-Kom, Damanhur and Damietta.

## THE STAFF IN 1903.

Mr. Perry has, as always, devoted his entire energies to the administration of his Service and has reason to be satisfied with the results of his year's work. He brings forward the names of certain officers of his Staff for special mention, and I cordially endorse his words of praise regarding each one of them.

## II.—THE SURVEY DEPARTMENT.

The following Table shows the expenditure for la	st year :	
	19	03
	L.E.	at,
Permanent staff	10105	693
General charges	44590	539
Geological survey	3140	682
White and Blue Nile measurements	2445	728
Reproduction of maps	2459	720
	L.E.62742	352
This total is again subdivided thus :-		
1902	19	03
L.E. M.	I.E.	31.
Allotment in Public Works Budget 34005 912 Allotment given by Finance Ministry	32485	352
for the Revenue Survey 20173 000	30257	000
Total L.E.54178 912	62742	352

The expenditure for 1903 exceeds that for 1902 by L.E.8563.440. The increase being in the allotment made by the Finance Ministry for the Revenue Survey.

Captain Lyons goes into considerable detail regarding the working of his Service and his report is full of interesting matter. I am unable to do more than very briefly allude to the main points of interest in his note.

## THE REVENUE SURVEY.

The Provinces of Kaliubia and Dakahlia were completed in the year 1903. The survey of Kena Province was begun. The whole of the Delta has now been surveyed for Revenue purposes.

Captain Lyons makes a good suggestion with reference to the maps deposited with the land registers at the Mudirias. Sales of land are constantly taking place, but, at the Mudirias, there is no accurate system of keeping these maps up to date and thus the map may, in a few months, no longer represent the actual state of the properties, and the mutation register, not being properly kept up, is of no use in revision of the map. He suggests that an annual expenditure of L.E.2,000 be granted for the purpose of keeping these maps up to date by means of a cadastral office in each Mudiria, controlled by the Survey Department. The proposal seems a good one and, if the registration of title deeds is ever introduced, some such arrangement will be necessary.

## MAPPING DEPARTMENT.

The sale of maps and publications is steadily increasing. In 1903, a sum of L.E.1721 was thus collected.

In the same year 122817 maps and 30904 publications were issued free of charge to the Government Departments, while 13071 maps and 1648 publications were sold.

## TRIANGULATION.

In 1903, the major triangulation of about one-third of Kena and Girga and of Aswan, from Dabba northwards to Esna, was completed.

Base lines were measured at Addedan, Dabba and Khattara and another at Tema for the Girga triangulation. Captain Lyons describes the methods of measurement.

The cost of major triangulation was L.E. 2065, for which some 4100 square kilometres were triangulated.

#### FIELD SURVEY.

752000 feddans were completed in 1903, which is the largest area yet completed in any one year. It is satisfactory to learn that there has been a steady reduction in the cost per feddan during the last two years, both in field and record work.

#### Topographical Maps.

Owing to want of funds, progress with this most useful work has been but slow. It is much to be hoped that an increased credit may be obtained in the future. Such maps are invaluable to the Irrigation Service, more particularly as regards the study of new projects.

### THE GEOLOGICAL SURVEY.

Some of the staff was employed, at my desire, in measuring the discharges of the White and Blue Niles for several months of the year. In 1903, Mr. Barron reviewed the geology of the country between Cairo and Suez, while Mr. Beadnell continued the collection of fossil remains from the upper Eocene beds near the Fayum. Dr. Hume was occupied with the arrangement of the museum collections.

During the year, reports on a portion of the eastern desert and on the Baharia Oasis have been published.

An arrangement has been made with the British Museum authorities, by which the latter will publish in a monograph a full description of the whole of the fossil remains from the Fayum, collected during the last few years. This monograph will include the material existing both in Cairo and London.

#### METEOROLOGICAL DEPARTMENT.

New stations were equipped in 1903 at the following stations:-

At Mongalla and Ghaba Shambé on the Bahr-el-Gebel;

At Wan on the Bahr-el-Gazal;

At Doleib Hilla and Nasser on the Sobat.

Captain Lyons gives a list of all the stations now existing in Egypt, Abyssinia and the Soudan.

#### THE CAIRO OBSERVATORY.

The transfer of all the instruments from Abbassia to Heluan took place at the end of the year. In consequence of their pending move, no new work was undertaken in 1903.

#### THE LABORATORY.

The record of work for the year, under the able direction of Mr. Lucas, was very satisfactory. In the chemical section, 288 analyses were made during the year.

In the physical section, 111 samples of cement and hydraulic lime were tested for tensile strength, etc., while 162 samples of brick and

building stores were tested for crushing strength, etc.

The section of weights and scales.

A certain amount of work was done in 1903 for the Government Department.

The gas testing section.

Regular and systematic testing of the Cairo gas was carried out last year. A complete set of the apparatus having been received and erected at the beginning of 1903. This apparatus is exactly similar to that at present used in Paris.

The testing has resulted in a considerable improvement in the illuminating power of the gas supplied in Cairo by the Gas Company.

## NILE GAUGES IN THE SOUDAN.

Captain Lyons gives a list of the gauges erected within the last two

or three years, on the Upper Nile.

A certain amount has been done in recording the river levels, but much more remains to be done and, of the duties of the future irrigation service in the Soudan, few will be more important than the erection of satisfactory Nile gauges; their safe-guarding, and daily record.

As Captain Lyons remarks—"Many of these gauges have been moved from time to time" and thus, unfortunately, in some cases,

a long record has been lost.

Many of those erected are purely temporary, and even the inclined teak gauges, though better than the others, are not entirely satisfactory. All gauges require constant looking after, and the one, of all that I have inspected in the Soudan, which was in the best order, was the gauge erected in front of the American Mission, at Doleib Hilla, on the Sobat; thanks to the care bestowed upon it by the members of the Mission.

Bench-marks are indispensable at every gauge site—otherwise, if the gauge is moved or broken, as has so frequently happened in the past, there is no means of connecting the readings of the new gauge with those of the old one and a valuable record is thus rendered valueless.

## GENERAL SCIENTIFIC OBSERVATION.

A certain amount of scientific observation has been carried out in 1903 on a small scale, such as the equipment of a few meteorological stations, the discussion of meteorological data which has been accumulated, the chemical examination of soils and water, and special lines of research at the Observatory. All the above subjects have however been taken up by the ordinary staff of the Department, in the spare moments of their work, but the limit of this time has been reached. Until some financial provision for scientific research can be made, further progress in this direction is impossible.

With an annual allotment of a few thousand pounds, added to Captain Lyons's budget, a great deal could be done, and not only Egypt

but the world would be the gainer.

I may mention one very important work, for which, in my opinion, a special credit is urgently required—I mean a system of precise levelling, commencing in Egypt and carried up the Nile Valley into the Soudan.

In a country like Egypt, so entirely dependent upon irrigation and consequently upon a knowledge of the levels of the river and of the country, it is indeed strange that no precise levels of the Nile and of its valley exist. I allude to this, as being one of the most crying wants, but it is only one of many scientific operations which would, if funds were forthcoming, be carried out in Egypt. Captain Lyons has a very highly trained staff, but they are all over-worked and, without special funds, can do but little. With an extra annual credit, say of L.E.5000, to be devoted purely to work of scientific research, good progress could be made, and there can be no doubt that the result that would be obtained would be well worth this small expenditure.

## THE STAFF OF THE SURVEY DEPARTMENT.

Captain Lyons, in his report, mentions many of the members of this staff. I wish to add my testimony to his as to the very excellent services that these gentlemen have rendered. If do not mention any of them by name, it is only because I find it impossible to select any one of them for special mention. One and all of them have done well, and Captain Lyons has every reason to be content with the results of this year's work.

## III.—THE TECHNICAL SERVICE.

The expenditure for 1903, excluding the Government Arsenal, was as follows:—

follows:—							
						190	3
						LE.	31.
Permanent Staff						5584	828
P49 5 9 1 (MA					001	2918	721
£1 3 3						642	973
37						1095	201
Repairs and maintenance of Govern		where	9116313	4		4848	SUS
Rebuts and mannetance or Govern	11224 182	1-120	9884.5				_
	Tutal			***	LE.	15090	531
This is less than the expenditure	e for	190	12.	by I	J.E. 4	13730.	
The details of the last item are	HS FOI	TOM	5:-	_			
						L.E.	M.
Cost of working steamers	7 9 7			***		2180	491
Repairs and maintenance						2235	359
Petty expenses and contingencies						432	1158
· · · · · · · · · · · · · · · · · · ·					-		
	Total				Lak	1848	308

This sum does not represent the real cost of the up-keep of these steamers, but merely that which appears in the Ordinary Budget. Thus, in 1903, the actual expenditure incurred was L.E. 6374, the difference being met from the Arsenal receipts, and the hire of the steamers themselves.

The items of Permanent and Temporary Staff, etc., require no special explanation. They are practically the same as in previous years.

#### THE GOVERNMENT ARSENAL.

The value of work executed by the Arsenal, in 1903, amounted to L.E. 21327, as against L.E. 28357 in 1902.

The following is a distribution of the charges:-

				1903
	4+4			17021
				5052
1.0.0				247
	* * *	***	***	0 2001
			LE.	21327
	0 0 0 			

The value of the work executed at the Arsenal in 1903, was less by L.E. 7030 than in the year 1902. This is due, to a certain extent, to a reduction in the work carried out at this establishment for private individuals.

Private work is now discouraged as far as possible, as the Arsenal is not intended to compete with the different trading establishments in Egypt, or elsewhere. Its primary object is to carry out work to meet the requirements of the Government Services. It will, in future, as far as possible, be reserved for the execution of this work alone.

The amount of work executed for private individuals in 1903 was L.E. 241.

The Government steamers were all overlanded and repaired before the flood of 1903. Some of these boats are hardly worth repairing, and it would probably be cheaper to sell them for what they would fetch and apply the proceeds towards the purchase of new boats, with more economically designed engines.

Stores and coal to the value of L.E. 11323 were issued from the Arsenal in 1903. Anis Pasha gives full details of the work turned out by this establishment. His report is a testimony to the excellent work done by the Director of the Arsenal, Mr. H. Cartis.

## INSPECTION OF STRAM ENGINES.

The work in 1903 was satisfactory. The inspections were made without any of the old difficulties on the part of the engine proprietors, whether European or native. The licenses are now regularly demanded, and are made out without any unnecessary delay.

367 applications for licenses were received in 1903 as against 290 in 1902.

362 engines were licensed last year. Of these 233 were examined and their boilers tested.

In all, 1903 industrial engines are now working, duly licensed, in Egypt.

The "Contraventions" were few in number: 49 in all. 41 of these were before the native courts and 8 in the Mixed courts. 11 engines were stopped from working by the Native Tribunal and 6 by the Mixed Tribunals.

Three boiler explosions occurred during the year.

## QUARRIES.

43 new licences were issued in 1903 and 73 old licences were cancelled. The total number of licenced quarries in Egypt are at present 583. Of these 464 are for ten years and 119 in perpetuity. These last are the old forms of licence and such permits are never now

granted.

Anis Pasha has administered his Service in his usual able manner. His name stands so high that any words of praise from me must be more or less superfluous. I have already mentioned the good work done by Mr. Curtis in the Arsenal, and in the other branch of the Technical Service, viz., the control and regulation of steam engines, Mr. Crawley has rendered valuable assistance.

# IV .- THE MUSEUM AND ANTIQUITIES DEPARTMENT.

The expenditure for 1903, under the regular budget, was as follows:-

Permanent Staff Temporary Staff General Expenses	 ***	 		 	5.8. 7403 3594 3417	272 213
			Total	 L.E.	14411	820

Each of these items shows an increased expenditure over that of the previous year, the total excess amounting to L.E. 1227.315 Mill.

To the foregoing is added :-

Receipts from Tourist functions to the Museum Sale of objects	***	***	***	400	***	***	000	1050 543	100 090 885
rane in Internetions.							I.F.	6833	988

It is satisfactory to note that all the above receipts show an increase over the figures for 1902. The total increase amounts to L.E. 864.076 Mill.

This expenditure is controlled by a permanent Committee, of which the Director General of the Antiquities Service is the President.

As in 1902, a sum of L.E. 4000 was granted by the Caisse de la Dette, for the compilation of the Museum Catalogue and for the repairs to the Karnak Temples.

The expenditure on the latter work was L.E. 2000 in 1903, the

balance being devoted to the preduction of the Catalogue.

Monsisur Maspero's report upon the working of his Service is of extreme interest and will well repay perusal. It contains a record of a good work on the part of himself and his staff. I regret that want of time prevents my doing more than making a very brief allusion to the chief points discussed.

### THE ALEXANDRIA MUSEUM.

The Service sufferred a loss in 1903, by the death of Monsieur Botti, the curator of the Museum in Alexandria. By the end of the year his successor had not been selected.

### THE CAIRO MUSEUM.

The installation of the collection was continued and improved upon in 1903. The lighting in the upper story was altered and much improved, by the introduction of screens and wooden shades to the skylights. The painting of the interior was commenced by Monsieur Maspero's own staff, from funds provided by the Public Works Department. This work will be continued by degrees. A new room has been opened for the collection of the zoology and flora of ancient Egypt. The monument to Mariette Pasha was completed and his statue was placed upon it early in 1904.

### THE WORK OF THE SERVICE IN GENERAL.

The electric lighting of the tombs of the kings at Thebes functioned well throughout the season and without accident. The removal of the earth at the Ramseum and at Medinet Abou was proceeded with.

The tomb of Thotmes IV was discovered, but had unfortunately been rifled.

Considerable repairs were executed at the temple of Edfu by Mr. Barsanti. This temple was in a most dangerous state, and consolidation was an urgent necessity. L.E. 1596 was expended in 1903. The west wall was pulled down and rebuilt.

At Karnak, Mr. Legrain re-erected the eleven columns of the great hall which collapsed in 1899, to a height of 6 metres above the floor. The earth in the centre of this temple has been cleared away and the masonry consolidated.

At Phile, Mr. Maspero says that the work done by the Public Works Department, in 1901 and 1902 (in the way of underpinning and consolidating the foundations) was so good, that in 1902, the total sum spent upon repairs to these temples was only L.E. 10.

At Sakkara, the work, round the pyramid of Ounas, commenced in 1899, was completed.

A great deal of work was done by private Societés and individuals in 1903. Monsieur Maspero gives a full and very interesting account of the year's record.

Unfortunately, Monsieur Goubert, of the Institut Français d'Archéologie, was killed at Tounah, by a fall from the rocks,

The receipts of the Service, outside of the Budget, show an increase in 1903.

The following are the details:-

NATURES OF RECEIPTS	1901-19	200	1902-19	903	Increase,		
Tourist fund	3796 926 625 621	500 610 550 550	3951 1050 714 4117	м. 100 885 090 913	154 124 88 496	600 275 540 660	
Totals L.E.	5969	912	6833	988	864	076	

## THE MUSEUM CATALOGUE.

Four new volumes were published in 1903. Six more are in the press.

## THE EXHIBITION AT ST. LOUIS.

A collection of objects, including life-sized models depicting scenes of ancient Egyptians' life, has been despatched to America for exhibition.

### V .- AGRICULTURAL RAILWAYS.

The working of the Agricultural Railways was, on the whole, satisfactory in 1903. These lines tend to assist the development of waste lands; they give the Fellahin better markets for their produce, and they generally act as feeders to the trunk lines.

It must be admitted that they do, in certain local instances, compete more or less with the Government Railways, but in such cases the landowner benefits, as he is a gainer by the competition. The Government Light Railways Commission is at present studying the whole question of readjustment of the classification of goods and rates upon these agricultural lines.

### 1.—THE EGYPTIAN DELTA LIGHT RAILWAY COMPANY.

The receipts of this Company, to the end of September 1903, show an increase of L.E. 3861 over the previous year. This result is a fairly good one, if it is considered that all markets were closed on account of the cattle plague and that the transport of stone to the Zifta barrage had ceased. This last item alone in 1902, brought in a sum of L.E. 14426.

The working expenses in 1903 increased by 4°/, over that of 1902. The following is a table of receipts and expenditure

					1902	1903
					Tan J¢v	Ing Rin
Receipts	*** ***				125610	129471
Working expenses	*** ***	*** ***			77193	80420
Nett receipts				000	48417	49051
Proportion of working	expense	to gross	rece	ints	61.46%	62.18%
Passengers carried				001	3,311,448	3,636,688
Goods carried—tons	***		000	001	463,928	471,529

The above cannot be considered as other than satisfactory returns.

The total length of the Company's lines is now 813 kilometres, of which 12 were constructed in 1903.

37 kilometres more are under construction.

With regard to rolling stock, the Company is still very short both as regards engines and waggons.

## II.—CHEMINS DE FER DE LA BASSE-EGYPTE.

The following is the statement of receipts and expenditure: -

				1902	1903
				L.E.	L.E.
Receipts	100 111			21857	23092
Working expenses				11150	11381
Nett receipts		***		10707	11711
Proportion of working exp	enses to	gross	receipts	51%	47:696
Passengers carried	*** ***	100		617,443	668,311
Good carried-tuns				54,642	55,000

## III .- THE FAYUM LIGHT RAILWAYS.

The following are the returns for 1903 as compared with the year previous:—

	1902	1903
	L.E.	La E.
Receipts	12130	18423
Working expenses	11225	13251
Nett receipts	904	5173
Proportion of working expenses to gross receipts	12.20	72%
Passengers carried	439,993	478,853
Goods truffic-tons	116,797	75,550

These figures are very fairly satisfactory. The result is largely due to the energy of Mr. Rangabé Bey, the General Manager.

The increase in the working expenses is due to the appointment of a better paid staff.

No extension of lines was made in 1903. The total length is 168 kilometres.

The Government Inspectors reports that the general administration of this Company still shows evidence of slackness.

Mr. Gunn's report upon the working of these lines in 1902 is full of details and will repay study by all interested in the question of light railway progress. These lines now compare very favourably with those existing in many parts of Europe.

## VI.-THE ZOOLOGICAL GARDENS, CAIRO.

Under the very able management of Captain Flower, these gardens have prospered well and made great progress during the year just passed.

The following is a summary of the receipts:-

							L. K.	Ma
Balance credit from 1902				***		400	191	386
Covarnant crants							3144	
Gate receipts	 						1217	410
Miscellaneous etc	 	400	940			* 4 *	61	291
								087
			Tota	11	* * *	Lin	E.4614	(191

This is less than the total of the receipts for 1902, by L.E.452.446. On the other hand, the expenditure in 1903 was less than that for the year previous, being L.E.4504.526, against L.E.4875.147.

Consequently the balance to credit at the end of last year was L.E.109.561.

Considerable improvements were made in the way of housing the collection and several new specimens were added.

On the 6th of October 1903, there were 959 animals and birds in

the garden, comprising 222 different species.

Captain Flower, in addition to superintending the Zoological Gardens takes charge of the collection of Nile fish in the aquarium at the

Ghezirch grotto.

Twenty-five varieties of fish, belonging to nine different families, are now to be found in the tanks. The collection is well arranged, and worth a visit. Unfortunately, it does not seem to attract the ordinary visitor, beautiful though the gardens, in which the aquarium is located, are.

The expenditure upon the tanks and fish in 1903 was only

L.E.74.191.

## VIL.—THE CENTRAL OFFICE.

The following is a detail of	of the expenditure :-
------------------------------	-----------------------

The following is a detail of the ex	V LICIT	FFIFE	11 6 ".				
ζ.						L. E.	M.
Danisa manda aka 65						24944	468
Permanent staff	* * *	0.04	0.00	000		1968	082
Temperary staff		0.04	1		9.0 4		758
General charges			***			3183	
Material and furniture		***	100			114	805
New works (1),						1.17889	728
					_		
	Te	atul			L	E.48100	841
						-	
445 2003 - 1 - 1 - 7 - 7							
(1) This item is thus made up:-	_						
						L.E.	Ma
Onera house subvention and staff						6746	960
Opera house subvention and staff	0 6 0		•••				
Maintenance of above	***		4 4 4		***	6746 1276	960
Maintenance of above Zoological Gardens	***	***			***	6746 1276 1500	960
Maintenance of above	***		4 4 4		***	6746 1276 1500 999	960  998
Maintenance of above	***	***			***	6746 1276 1500 999 1796	960 - 998 750
Maintenance of above	0 6 0 7 7 7 0 0 0	***	***	200	***	6746 1276 1500 999 1796 5448	960  998
Maintenance of above	0 6 0	***	***	200 010 010	***	6746 1276 1500 999 1796	960 - 998 750
Maintenance of above	0 6 0	200 000 000 000 000	0 0 0 0 0 0 0 0 0 0 0 0	***	000 000 000 000	6746 1276 1500 999 1796 5448 120	960 
Maintenance of above	0 6 0	200	0 0 0 0 0 0 0 0 0 0 0 0	***	000 000 000 000	6746 1276 1500 999 1796 5448	960 - 998 750 020

or more than that of 1902, by L.E.7287.639.

This increase is chiefly due to the expenditure upon the inauguration of the Aswan Reservoir, and that upon the new lock at Aswan.

## THE STAFF IN 1903.

Monsieur Boinet Bey, the Secretary General, has given me the most efficient assistance throughout the year. His services have been of the greatest value.

As regards the services rendered by Mr. Farid Bey Babazogli, the Chef du Service Administratif, I have nothing to add to the remarks I have made in previous reports. They have been quite exceptional.

The entire staff has worked well.

### W. E. GARSTIN,

Under Secretary of State for Public Works.

Cairo, the 25th June, 1904.

# ADMINISTRATION REPORT

OF THE

# IRRIGATION DEPARTMENT IN UPPER EGYPT

For 1903

BY

A. L. WEBB,

INSPECTOR GENERAL OF INDIGATION UPPER EGYPT.



## ADMINISTRATION REPORT OF THE IRRIGATION DEPARTMENT IN UPPER EGYPT FOR 1903.

## Part I.-IRRIGATION AND DRAINAGE.

## SECTION I.—THE NILE.

In previous annual reports it has been customary to describe the state of the river during the various seasons by comparing the levels of the year with those of the preceding one, or of some special year of high or low levels. In past years the Aswan gauge has been taken as the basis of these comparisons, but owing to the completion of the Aswan Dam, and the filling of the Reservoir during the last months of 1902 and the three first months of 1903, and the utilization of its stored water in April. May and June of 1903, it can no longer be so accepted, for it is considerably affected by the operations of working the sluices of the Dam. Firstly, while filling is being carried out, the gauge which is situated near the Aswan town at a distance of five kilometres downstream of the Dam, records lower readings than it would if no dam existed, as a portion of the discharge of the river is daily retained in the reservoir: secondly, when the reservoir is full, and it becomes necessary to supplement the summer supply of the river for Middle and Lower Egypt, a portion of the stored water is daily discharged, and higher gauge readings consequently result.

Except, therefore, for the flood months of July, August, September and October, during which the sluices of the Dam are fully opened, and the supply passes freely, the Aswan gauge must be rejected as a

basis of comparison with former years.

It is, consequently, necessary to select for the winter and summer months a gauge, which is unaffected by the working of the Aswan Dam, and Halfa, being a reliable masonry gauge, can be chosen. In order to preserve a comparison with the past, the readings of the Halfa gauge will be taken for the last year of the old system (1902), before the Dam was first brought into use in 1903.

Halfa Gauge. (Winter and Summer supply).—The following statement gives the reading of the Halfa gauge on the 1st and 15th of each month of 1902 and 1903, as well as those of November and December 1901, omitting the flood months of July, August, September and October for the reasons given above. Vide Plate I.

	Nov	emh.	Deci	mh.	Jam	inry.	Febr	пагу	Mn	reh	Ap	ril	36	ny	Ju	nu
YEAR	let	läth	lat	Lith	1st	15th	let	läth	Ist	läth	lst	läth	lst	E5th	lat	Eath
1901	4-33	8175	a-28	3-00	2-70	2 - 20	1 - 0 1	1 . 73	} = 45E1	1.30	1.35	1+(5)	1+22	1 - 23	1-13	E - Chr
1902 1903	4 • (11)	3-62	3-37	3-10	2.20	8 - 24	1 - 24)	1 51	1 - 160	1:42	1.22	1 - 1 - 1	1:40)	1-411)	0.98	I t ti a
1903	5-85	1.68	a · 80	3 411												

From the above it will be seen that the levels during the winter 1902-1903 were higher than those of 1901-1902, but during April. May and first half of June, they were even worse in 1903 than the exceptionally low levels of 1902 for the corresponding months, and the supply for the summer crops would have been very poor, but for the extra amount given by the Aswan Reservoir. The early rise in June was, moreover, of great assistance.

The minimum levels registered at Halfa were :-

In 1902 1-13 from 30th May to 2nd June.

In 1903 0:95 on 21st May.

The levels in November and December 1903, as shown above, are somewhat higher than those of 1902 for the same months, and consequently, the prospects for 1904 are better than for the year under review.

Aswan Gauge. (Flood Months). Vide Plate II.—At the beginning of July the Reservoir was empty and the river passing freely through the sluices of the Dam; on the 7th July the level was almost that of the average of 20 years (1873-1892). During July the rise was fairly normal, but the levels attained were below the average: during the first week of August the rise was slow, and at the end of that week there was a break till the 12th, which rendered the rise late and slow: after that date the rise was fairly rapid and continuous till the maximum of 16 pics 6 kirats (R.L. 92-93) was

reached on 27th August; from 25th to 28th August the levels were just above the mean of 20 years, but from 29th August they fell again, and remained so till the end of the year, except for a few days in October, and first half of November, when an unexpected rise occurred for 2 or 3 days.

For 41 days, i.e. from August 23rd to October 2nd, a level of 15 pies, and above, was maintained: this satisfactory level made the flood of 1903 a fairly average one, and similar to those of 1897, 1900 and 1901,

us is shown by the following table:-

	1897	1900	1901	1903
Aswan Gauge Beadings	p.b.	p.k.	p.k.	p.b.
Maximum Menn of 40 days August 16th to September 24th	16.0 15.6	16:5 15:7	16·1 15·3	16.6 15.3

Summing up the observations at Halfa and Aswan, the following results are obtained regarding the state of the river during 1903, viz:

(a) During the winter months the levels were low.

(b) During the summer months the levels were extremely low.

(c) The early rise in June was very beneficial.

(d) The flood was late in its early stages, but afterwards improved. and finally resulted in becoming an average one.

At Asynt.—The following statement shows the average of the daily gauge readings at the head of the Ibrahimyiah Canal during the summer months of 1903 and in typical years.

HEAD OF IBRAHIMIYAH CANAL.

YEAR	AVERAGE	Gauge-Readu	NGS AT ASYUT	Nature of	
	April.	May.	Tippe	July	Summer Levels.
1899 1885 1901 1889 1892 1900 1902	46.50 45.52 45.03 44.99 45.24 44.89 46.24	45.91 45.13 45.15 44.75 44.77 44.88 46.26	45.47 44.87 15.42 11.57 44.58 45.17 46.60	46.52 47.25 46.69 45.60 45.55 46.19 46.46	High. Fair. Low. Very Low.  Regulation first made on the Asynt Barrage.  Asynt Reservoir first used for giving supplementary supply

Owing to the regulation on the Asyut Barrage and the supplementary supply in the river from the Aswan Reservoir for the first time, the levels at the head of the Ibrahimiyah Canal were the highest on record, notwithstanding the very low state of the river at Halfa during the summer months.

The real rise of the flood reached Asynt on 25th July, and steadily but slowly continued until the 3rd August, when there was a break for a few days; on the 7th it again commenced to rise till the 11th August, when another break occurred; from the 15th August the rise was rapid, and continuous, until the 28th when a gauge of 51.64 was attained; from the 29th August the gauge fluctuated until the 16th September, when the maximum of 51.67 was reached; after that date the levels were well maintained until the end of the flood.

At Sohag.—In last year's report the level of the Sohag gauge was introduced for the purposes of comparison with previous years: as this gauge is now affected by the supplementary supply from the Aswan Reservoir, it should be omitted in future.

Gauges at the first Cataract.—The following statement gives the highest and lowest levels recorded above and below the first Cataract for the past seven years:—

	£9			MINIMUM	GAUGE R	MAXIMUM HAUGE READINGS.			
	YEAR.		Philip.	Aswan.	Difference.	Philas.	Aswan.	Difference.	
1897				 90°56	85·62	Metres 4 · 94	8.L. 97+95	92·80	5.15
1898		400		 89.74	84.74	5:00	99*05	93.63	5.43
1899	***			 90.70	85-15	5.35	97-00	91-67	5.33
1900	***		8 0 5	 91.50	84.07	7-13	98-54	92.91	5.63
1901				 (R1*(R)	84-54	6-36	99.07	15.85	6 25
1902	* * 4			 01.10	81.43	6.61	97-70	91.72	5.38
1903	***		200	 (15-110)	84:35	K-55	98-94	92.75	6.19

The Philæ gange is on the Philæ island one kilometre upstream of the Dam: the Aswan gauge is on Elephantine island, opposite Aswan town, six kilometres downstream of the Dam. Between the Dam and the Aswan gange there is a considerable fall over the rapids in the different channels of the river, so that the above figures do not give the actual head on the Dam and are somewhat misleading.

Comparing the different years, it would seem that the actual afflux due to the Dam is about 50 centimetres, which is very satisfactory:

owing to regulation on the sluices of the western channel to assist navigation a comparison with former years is, however, not reliable.

River gauge South of Halfa.—These are now recorded by the Director General of Surveys, who has a complete register of all gauges.

#### SECTION II.-SUMMER IRRIGATION.

The volumes entering and utilized in the Ibrahimiyah Canal during the summer months of the last five years, and the very low years of 1889 and 1892, are given below in cubic metres per second, together with the dates of the complete closure of Deirut Escape:—

	Arı	III	М.	NY.	Je	NE.	Date of complete closure		
YEAR.	Discharge at load.	Discharge utilized.	Discharge at head.	Pischarge millzed	Discharge at head.	Discharge utilized.	" 2 43		
1889 1892 1899 1900 1901	87.1 48.4 145.1 46.9 48.4	97°1 48°4 96°5 46°9 48°4	32·5 36·1 123·5 41·9 46·6 55·5	32·5 36·1 118·4 41·9 41·8 55·5	26.4 29.5 83.0 49.4 64.6 64.6	26·4 29·5 83·0 {46·1 64·6 61·4	toth February.  1st June.  1st June.  (the February. (the-closed 10th June.  1sth February.  1sth to 10th June.  1sth February.  1sth to 10th Juneary.  1sth to 10th Juneary.  1sth feb to 22th Feb.  6th Feb. to 22th Feb.  6th Mar.to 25th Mar.  27th June to 5th July		
1903	117 - 7	117.7	104.8	104.8	124 · 3	124:3	on February.		

N.B.—In 1900 and 1902 regulation was made at Deirut for the benefit of Lawer Egypt, as the discharge entering the head of the Ibrahimyiah Canal was in excess of the proportionate share for Middle Egypt.

The discharge utilized varies with the discharge available, and after the complete closure of the Deirut escape, the whole of the available discharge is utilized.

From the above it will be seen that the supply available, and utilized, was excellent in April and May, and in June far greater than obtained in any previous year, in spite of the low state of the river at Halfa; the increased supply is due to the benefit derived from the Aswan Reservoir. The result was to ease the rotations in the old perennial area, to give sefi water to the converted Asyut basins, and half the Minia basins, and also to the whole of the Fayum Province, which had only been partially supplied in previous years.

Supplementary supply from the Aswan Reservoir.—In 1900 and 1902 regulation was made at Deirut for the benefit of Lower Egypt, and part of the Ibrahimiyah discharge was escaped there, as the supply at the head of the canal was in excess of the proportionate share of the river for Middle Egypt.

In 1901 there was no regulation at Deirut, and the discharges of that year were taken as a basis for the requirements for Middle Egypt. The discharges of 1901 for April, May, June and the first half of July, gave a mean of 6 millions, and this supply was insufficient. To this was added \(\frac{1}{2}\) million to make good the deficiency, another million for easement of rotations on the old perennial area, and 2 more millions for extra sefi area expected in the converted basins and the Fayum, the whole making a total of 9\frac{1}{2}\) millions.

The additional supply to be received from the Aswan Reservoir to give this 94 millions was thus arranged:—

Required at From 1st April to 15th May... 3 millions To be let go seven Asyut 16th May to 30th June 4 " days earlier at Aswan 5", 1st July to 14th July... 5",

The actual discharge at the head of the Ibrahimiyah Canal, which was utilized, gave 9½ millions during April, May and June; during the first half of July it was in excess of that amount, as it was found possible to let the reservoir be discharged earlier than anticipated, owing to the early rise at Halfa; to obtain a discharge of 9½ millions a level of 16.50 to 16.55 is required at the head of the Ibrahimiyah.

Owing to the low levels of the river, it was found necessary to supplement the river discharge by 1 million a day from 10th to 24th March for the Ibrahimiyah supply; this, however, should have been avoided, as water was still leaking through the Delta Barrages.

Fayour supply.—Up to the end of 1902 applications for sakiehs to replace shadoofs, and engines and pumps to replace groups of sakiehs, had been generally refused throughout the 4th Circle, but with the advent of the Aswan Reservoir they were granted during 1903. There were numerous applications for the areas on the sahels of the Yusufi from Deirut to Lahun, and with the object of giving an increased supply for this extension of sefi area and for the expected increase in the Fayum, regulation on the Yusufi head was made as follows:—

During first half of April 30 cents higher than levels of 1902.

During second half of April 20 cents higher than levels of 1902.

During first half of May 20 cents higher than levels of 1902.

During second half of May 10 cents higher than levels of 1902.

The old area of the Fayum Province was taken as 330,000 feddans, and it was assumed that one third or 100,000 feddans, requiring 3 millions per day, would be put under sefi crops: the area reported is, however, only 69,000 feddans, being an increase of 22,000 feddans over

the area of the previous year.

During April, and first half of May, the mean discharge of the two canals (Yusufi and Hassan Wassif) entering the Fayoum was 3,700,000 cubic metres per day, of which a considerable proportion was used for the irrigation of the berseem crop, which was late. From the second half of May to July, the discharge in the two canals gave just under 3,000,000 cubic metres per day, which is sufficient for the anticipated area of 100,000 feddans; the whole supply, however, seems to have been utilized somewhere, as the levels of Lake Qarum were not affected, as would have been the case had water been running to waste. The only conclusion that can be arrived at is, that the return of the sefi area as 69,000 is incorrect.

Rotations. - Rotations commenced on the Ibrahimiyah Canal and branches between 15th and 20th April. There were two classes of rotations on the main regulators of the Ibrahimiyah, viz:—

			Chass I.	Chass II.
Minia Regulator	244	 	7 days	8 days
Matai Regulator		 	ti days	7 days
Magaga Regulator		 	6 days	7 days
Above Sharahnah		 444	10 days	11 days
Below Shurahnah		 	12 days	13 days
On the Saheliyah Canal.				
			CLASS I.	CLASS II.
Alsove Raramun		 	9 days	10 days
Below		 	10 days	11 days
***************************************			*	

The more severe third class of previous years was rendered unnecessary by the supplementary supply from the Aswam Reservoir. During the summer of 1903 rotations were introduced on the canals of the Asyut converted basins. At first three groups were tried, but this was not satisfactory, and subsequently two groups or sections on each of the main canals worked successfully; they were as follows:—

On Deirutiyah Canal.—The first Section was everything north of the Dermuwas Regulator including the Ashmunin Canal and its branches. The second Section was from the head of the Deirutiyah to Dermuwas Regulator, with Ganabiyahs East and West of that regulator.

27132

On Budraman Canal.—The first Section was Budraman Canal below Beni Haram regulator, and all its branches in this length, Arus Canal and branches, and Nasriyah Canal north of Regulator in Tanuf Saliba with branches. The second Section was Budraman Canal from head to Beni Haram Regulator and branches (except Arus Canal).

Melwaniyah Canal and Nasriyah Canal from head to Tanuf Salibah bridges, with Ganabiyahs east and west at those bridges.

The classes of Rotations were :-

						CLASS L	CLASS II.
() <sub>11</sub>	Deiratiyah	Canul			***	10 days	10 days
(1	T3 1		200	• • • • •		8 11	10 %
UH	Badraman	Canal		, ,,,	***	8 41	111
59	0.4	411	2nd			10 4	11) ==

In the Fayum Province rotations were worked on the heads of the two main canals at Lahum, the Yusufi and Hassan Wassef, during June in alternate periods of 10 days each; this system seems to have been more satisfactory than the old one, and is certainly far more simple.

In the northern Minia converted basins where seft water was given for the first time, rotations were introduced from 21st April till 21st July. The canals were divided into three sections, each section taking water 6 days out of 18. The rotations worked successfully, but as the system of canals will not be complete until the Southern Minia basins are converted, it is too early to give any definite opinion on their final success.

The Cotton Crop.—The areas under cotton irrigated by the Ibrahimiyah Canal and its branches in the past six years are as follows:—

1898	 ***	*11	***		 	1-4	100,005	feddaus
1899 1900						100	90,887	n-ę
1901	100				****		92,842	22
1102					 	701	105,750 95,854	77
130C	 110			440		901	153,000	99

showing an increase of nearly 60,000 feddans over the previous year, and nearly 50,000 feddans over the previous record year of 1901.

The following statement, kindly furnished by Mr. Wakehan, Agent of Messrs. Carver Bros in Upper Egypt, shows the out turn of the ginning factories in the different provinces during the past six seasons.

SHASON.	Asyut.	Minin.	Ren) Suel.	Payme.	Tirral.	Avenuge price per kontar.	
	1 - 11 + 3 - a .	Lantars	kuntur	* cumus	& Built Mr.s.	P. T.	
1898-1899 1899-1900 1900-1901 1901-1902 1902-1903 1903-1904	Nil. Nil. Nil. Nil. Nil.	74,000 105,000 104,000 128,000 161,650	143,000 139,000 131,000 174,000 161,500 235,000	137,000 170,000 130,000 130,000 145,000 235,000	354,000 414,000 365,000 432,000 471,150 765,000	156 205 275 205 275 325	

The out turn of 1903-1904 shows an increase of 62 per cent over that of the previous year, whereas the increase in area under cotton cultivation is 60 per cent. It is generally allowed that the crop of 1903 was not as good as that of 1902: it may, therefore, be presumed that the areas under cultivation are incorrectly given, and should be greater in 1903 than shown above.

The following statement gives the area of feddans of cotton in the different provinces, irrigated by the Ibrahimyiah Canal and its branches, including the Bahr Yusef, during the past six years.

YEAR.	Asynt.	Minde	Reni Suef.	Faynus	Total.
1898	2,635	19,680	26,253	57,537	100,005
1899	1,874	20,576	92,277	46,160	90,887
1900	2,753	27,912	26,086	36,001	92,842
1901	3,361	20,589	28,177	47,613	105,750
1902	1,824	26,085	21,103	40,344	95,856
1903	8,310	54,527	31,872	58,254	153,002

There is a large increase in each Province; Minia is greatest with 28,000, Fayum next with 18,000, Asyut 6,500 and Beni Suef last with 4,800 feddans.

Besides the above areas there were 501 feddans irrigated from the Nile direct, and from wells in the Minia Province, and 6,297 feddans, in Beni Suef Province in the basins from wells and Nile direct. The increase in Minia and Asyut is due to the conversion of some of the basins, and to the decrease in the area of Qedi grown in the basins, as well as to the decreased area of sugar cane: in the Fayum, the increase is due to the better supply given in the summer months.

Sugar cane.—The following statement gives the quantities of cane crushed in the chief factories in Upper Egypt and the out turn of No. 1 Sugar during the past six seasons:—

	DAIR	а 843ппн	Dama St	Dama Sulvan Pasha.			Secrete Gastrick Statistics of Li Harry Euren			Entitles Strail		
SKARUN.	Came conduct	No. 1 Super	Porchille	Chistine	Onthru No. 1 Sumr	Percentage	Came	New I Sugar	Petrudam	Caster (Tusker)	New Lane 31	Pero utage
	Knntars	Kamare		Kanturs	Kanture		Kattitie-	Kantar-		Katetare	Kantar +	
1078-1090.	19,030,911	1,251,525	b 2	170,822	48,846	2.1	6. 7 16. 10 10 1	कार्क, भ⊴ुं	D 6	146,575	40,335	0*8
1000-1940.	11,515,565	1,200,002	9.1	100,027	42,005	910	5,07e,921	575,000	516	1 1 (, 2 ) n	10,000	912
1000-1001.	11 350 sea	1,101,471	D- 14	201,40H	a 50,410 B	100.1	n_00 = 772	682,587	tran	wan, ka	81.510	ขายก
1001-1902.	12,142,462	1,260,463	\$ every	110,460	0.0,210	(p 5	7,620,54+	018,818	0.40	-	-	-
1002-1008.	11,118,101	1,058,100	0.2	360,034	\$41,500	1-19	s,t01,757	700,883	u-u	-	-	-
1002-1904,	-	-	-	984,639	57,000	0:61	11,050,100	1,399,158	9154	-	-	

The total number of kantars crushed and the total outcome of No. 1 Sugar for each of the six years included in the statement are as follows:—

Sharon.	Unne ernshed.	of No. 1 Sugar.		
1898-1899	20,957,441 21,969,136 20,134,223 20,506,465 19,719,209 15,044,276	1,950,750 2,080,637 1,975,337 1,928,886 1,870,582 1,486,386		

The following statement gives the area under sugar cane irrigated from the Ibrahimiyah Canal in the different provinces, during the last six years, and the area grown South of Asyut irrigated by pumps and wells:—

YEAR.	Asynt.	Minin.	Reni-Suef.	Fayum	Potal.	South of Asynt.	Grand Total.
1898 1899 1900 1901 1902 1903	9,173 8,052	35,232 33,829 22,139 28,413 28,904 25,430	5,383 7,082 5,670 6,282 5,725 1,072	854 677 458 618 799 660	51,352 51,001 36,319 48,003 45,947 38,817	17,440 14,522 15,001 14,853	53,759 62,615 61,038 53,670

The figures of 1903 in Middle Egypt are less than those of 1902, owing to the substitution of cotton cultivation for that of sugarcane.

Sorghum or Summer Durah.—The following statement gives the areas of summer durah or "Qedi" grown in the basins of the different provinces during the last six years:—

	An	AREAS IN FEDDANS IN THE DIFFERENT PROVINCES.										
YEAR.	Aswiii.	Kena.	Girga.	Asynt South.	Asyut North	Minia.	Beni- Suef	Total Area				
1899 1900 1901 1902 1903		23,334 24,258 21,526 19,510 18,863	29,984 39,261 41,433 38,372 40,034	10,150 12,389 10,334 12,555 10,341	8,572 7,701 7,850 9,232 810	5,495 3,890 4,734 5,072 905	7,072 6,076 8,734 5,384 4,239	87,766 96,547 97,023 93,506 78,413				

<sup>\*</sup> This does not include the six northern basins of Minia, which were under conversion, and no accurate record kept; next year this item will disappear altogether from the returns.

Maize and Winter Crops.— The area of Nabari durah sown in the southern provinces is estimated at 134,000 feddans against 165,000 feddans in the previous years. The decrease is due to the better levels in 1903; in low floods the areas sown in the higher portions of the basins are considerably more than in years of good or average flood.

Duty of Water.—The total area of summer crops irrigated by the Ibrahimiyah Canal, according to figures furnished by the Chief Engineers, is shown in the following statement:—

PROVINCE	Cotten	Sugar Cane	Sett Derrole	Other Crope	Fota)
Asyut,,	8,349	8,646	7,263	-	24.258
Minia	54,527	25,430	11,701	1,197	92,855
Beni Suef	31.872	4,072	2,283	2,169	40,396
Fuyum	58,254	15033	-	10,055	68,978
Totals	153,002	38,817	21,217	13,421	226,487

In the above figures for Minia are included 2647 feddans irrigated from the Bahr Yusuf, which must be deducted when dealing with the Ibrahimiyah canal discharges; thus, the Minia area should be taken as 90.208 feddans, and similarly in Beni Suef an area of 10,485 feddans was irrigated from the Bahr Yusuf, therefore the Ibrahimiyah area in Beni Suef will be 29,911 feddans.

The mean and minimum discharges recorded during the year in the Ibrahimyiah and Yusufi Canals are as follows:—

CANAL	6			Site	April to June	Lowest remeded discharge c.metresporday.
1. Ibrahimiyah	* * *	* • •	* * *	Above Deirut	8,625,929	7,128,000
2				Below Deirut	. 5,332,978	4,001,184
7, ,,,		***		Maglagha	1,036,429	793,152
4. Bahr Yusuf Wassif	ď	Has	1113	. Lahun	3,289,124	2,354,400
5. Ibrahimiyah		7 4 4		From Deirut to Ma	4 - 245-7 7 215	3,208,032

N.B. The discharges for No. 5 are obtained by deducting No. 3 from No. 2.

Taking the areas in the different Provinces we obtain the duty of water in each group as follows, in cubic metres per day per feddau irrigated.

PROVINCE.	Total area of Creps.	Duty on men disclurge,	Daty on whitness recorded discharge,
1. Asyut. Minia, Beni Suef & Fuyum 2. Minia & Beni Suef together irrigated from Ibrahimiyah only 3. Beni Suef irrigated from Ibrahimiyah only 4. Fuyum	120 · 119 29 · 911 68 · 978	38 908 44 · 39 34 · 65 47 · 68 35 · 23	31 · 40 33 · 31 26 · 51 34 · 13 23 · 16

These duties are remarkably low, and can only be accounted for by the excellent supply enjoyed by Middle Egypt owing to the Aswan Reservoir and the Asyut Barrage. The mean and minimum discharges have no doubt been abnormally increased by the rapid discharge of the Reservoir in June, at the same time the duties show that the supply was more than sufficient; it should, however, be remembered that owing to a late season the berseem crop, which is not included in the sefi area, had to be irrigated up till the middle of May, and at the end of June the surplus water was used for irrigating Sharaki lands for the flood durah crop.

#### SECTION III.-FLOOD IRRIGATION.

General Character of Flood.—As already described, the flood was late in its early stages, but afterwards developed into one of average levels, and no real difficulties were experienced in carrying out the flood irrigation.

Filling the basins.—In the Aswan isolated basins water commenced to enter the canals on 14th August, and the basins reached their maximum levels between 27th and 29th August; all the water was utilized for the irrigation of the durah crop, so that none was discharged on to the river. The Sharaki area is about 1,000 feddans.

In the Ramadi system water entered the basins between 10th and 17th August, and T.R. levels were reached between 19th September and 7th October.

The level of the river at the head of the main canal was 0.81 metre below the T.R. level of the southern basin El-Ramadi, but only about 130 feddans were left sharaki.

A rotation was established between the basins and the Matana Teftish to give water to the sugar cane: it seems to have given satisfaction.

In the Asfun system, water entered the basins between 14th and 18th August, and T.R. levels were reached between 14th September and 14th October.

A rotation was also made in this system between the basins and the Daira Sanieh Teftish.

In the Fadiliyah system, water entered the basins between 15th and 18th August, and T.R. levels were reached between 30th September and 18th October.

In the Sahil Farshut system, water entered the basins between the 16th and 18th August, and T.R. levels were reached between 13th September and 10th October.

In the Kilabiyah system, water was admitted to the basins between 10th and 15th August, and T.R. levels were reached between 4th and 8th October.

In the Bayadia system, water entered the basins between 14th and 16th August, and T.R. levels were reached between 30th September and 12th October.

In the Shanhuriyah system, water was admitted to the basins between 11th and 17th August, and T.R. levels were reached between 27th September and 25th October.

In the Ghilazi system, water entered the basins between 15th and 18th August, and T.R. levels were reached between 21st September and 19th October: this system was fed through the Kena Khor for the first time.

In the Girga Directorate the main canals were opened between 10th and 15th August, but, owing to the low levels at the commencement of the flood, water did not enter the basins of the following systems until the dates shewn, viz:—

Khiyam System	hetween	0.04		15th	and	17th	August
Akhunin South Solug	9.1		0.04	12th			93
North .	**			12th 13th	4.4	23rd 24th	44
Khizindariyah	97		804	13th	20.4	22ml	97
			000	Want St	0.4	or out FET I	4-9

Wherever possible, the tail escapes of the different systems were opened so that water might enter into the basins direct from the

river: in no case, however, did this last more than a few days: no water was taken from the Samhud basin to feed the southern basins of south Sohag system, nor was any drawn from Hod Hamad for the Khiyam system.

Owing to the long period at which the Aswan gauge stood above 15 pies no difficulty was experienced in bringing all basins to their T.R.

levels early in October.

In the Asyut Barrage Directorate water was allowed to flow freely from the Sohagiyah through the Gebel Asyut Regulator, which it reached on 14th August. Regulation was made on Gebel Asyut Bridge from September 20th to bring the southern basins to T.R. levels.

The basins in the Asyut-Delgawi system were filled without difficulty from the Gebel Asyut Regulator, assisted by the Muharak and Qusiyah feeders from the Ibrahimiyah Canal, which were open from 23rd August to 26th September, and by the Delgawi feeder head which was opened whenever the 4th Circle could spare water.

The level maintained in the Yusufi downstream of the Deirut Head was R.L. 46,40, which proved perfectly satisfactory for the sahils on

the west of the Yusufi as far as Badraman.

On the east of the Ibrahimiyah Canal from Asyut to Deirut all basins were easily filled with the exception of the Wahaliyah basin, which was only brought to a sufficient level to prevent Sharaki by the flush in the

river, due to the discharge of the Abutig escape.

In the Abnub system, water entered the basins between 12th and 17th August, and the whole system was filled by 12th September, with the exception of Hods Goraib, Wasta, and Massara which were brought to T.R. levels from the Maghar El-Matmar Canal between 13th and 15th October.

In the 4th Circle Mr. Clowes describes the filling of the basins as follows:—

"The Bahr Yusuf was maintained at a level of 46,40 below Deirut from 23rd August to 2nd October, when it was lowered to allow of

takfif from Hod Delgawi.

"Hod Tuna and its hoshah and Hod Beni Khaled in the Asyut Province, were late in receiving water, due to the tardiness of the cultivators in removing their durah crop. These Hods received their supply from the Yusufi, and were filled easily, Hod Beni Khaled being kept low purposely till the end of September to pass part of the Yusufi supply through the Hod.

"The flooding of the west of Yusufi basins, Minia Province, began from 12th August for the Northern system, and 15th August for the Southern system.

"Upstream Nezlet El Abid Regulator reached T.R. level of 40.50 on 24th August, and up to this date a downstream level of 38.50 had been kept for requirements northwards. During the last week of August the downstream gauge at Nezlet El Abid fluctuated, but throughout September a mean level of 38.90 was maintained, which is about 30 cents higher than in 1902, owing to a higher level of about 30 cents being run at Deirut in the Yusufi.

"Saqulah upstream level rose steadily, and reached its T.R. level of 34·50 on 1st October, an average level of 31·30 being maintained downstream for the benefit of the Lahun gauge till the middle of September: in the second half of September the level fell to a mean of 31·00. The Southern system of the West of the Yusufi Minia basins began takfifing at the end of September, which caused the downstream level at Saqula to rise, and also gave the upstream level required, which could not be obtained at an earlier date, as a greater head than 3 metres is not permitted on this Regulator.

"Due to the takfifing of West Yusufi basins, Minia Province, it was found possible to regulate on Mazurah on 30th September, and T. R. level was obtained above that Regulator on 3rd October. The downstream level was kept at a mean of 28°30 through August and September, and up to 11th October, which was sufficiently low to let

the Mazurah drain work efficiently.

"In the Beni Suef Province, the Nile level on 12th August was sufficiently high at Sharahnah to feed Hod Sultani, and the old Mezurah Head in the South West corner of Hod Sultani also passed in a small quantity of water on 19th August. From 28th August Hod Sultani maintained a gradual rise to the end of September, and was then brought up rapidly from the Yusufi by regulation on Mazurah.

"All the basins to the north of Sultani filled well: Hod Koshesshah was low all through September, and first half of October, but had a good watering in the second half of October; Hod Riqqah had a high level all through September and October.

"In Asyut, Hod Tunah and its Hosha were brought to T.R. level by 8th October from Hod Delgawi, feeding through Hatatbah Bridge. Hod Beni Khaled was left low till 28th September, and was brought up to T.R. level by 6th October, on which date it was let go, so as to allow part of the Yusufi sarf wave from Delgawi escape to pass

through it by means of its new big 5 arch escape. After 9th October it was up again to T.R. level on 12th October: to prevent the Hod falling when it has once reached T.R. level, it would be best to open the Beni Khaled escape simultaneously with the Delgawi escape.

"The West of Yusufi Minia basins were brought up to T.R. levels during the last week of September, except Hods Tukh and Bortobat, the southern Hods respectively of each system, which were brought

to T.R. levels in October by the sarf wave in the Yusufi.

"In Beni Suef Province, by regulation at Mazurah on 29th September Hod Sultani was brought up to T, R, level on 12th October and was kept full till the end of October to give the Southern end a good flooding in the last year before conversion to Sefi. The surplus water of the Hod, obtained from the Sultani Nili feeder, which was also working efficiently, and was not closed down till 19th October, was passed on to the northern basins, Nina Nuerah, and Bahabshin, which were all up to T.R. levels by 20th October, and kept so until 29th October. Hod Kosheshah began to feel the Yusufi Sarf wave on 16th October, and from this date rose rapidly to its T.R. level of 26:75 on 24th October and was maintained at that level for 5 days.

" Hod Riqqah was brought to T. R. level on 20th October."

Discharge of the Basins.—(5th Circle).—The following statement gives the dates of the commencement and campletion of the Sarf operations in the different systems:—

SAME OF SYSTEM.		Sari aperations	eustuu:	nced.	Sarf operations completed.			
		Between:				Berween		
Ramadi	8th	October and	Hith	October	25th	October	and 7th November	
Asfun	8th	40	14th	50	25th	44	10th	
Fadiliyah	8th	.,	19th	4.9	21st	100	31st October	
Sahil Furshut	Sth	11	17th	44	20th	44	4th November	
Killabiyah	4th		Sth	23	21th	**	26th October	
Bayyadiyalı			21st	**	dist	22	5th November	
Shanhuriyah	1		26th	**	24th	0-0	Silı	
	196		24111	**	28th	**	îtla	

Girga Directorate.—The following statement gives the dutes of the commencement and completion of the surf operations in the different systems:—

NAME OF SYSTEM.	Surf operations commenced.	Surf apprentions completed.		
Khiyam Akhmim Khizindariyah South Solmy North	Retween :—   3rd October and 11th October   3rd	Between:—  27th October and 30th October  19th 30th  19th 30th  21st 7th Nov.  16th 30th October		

Asyut Barrage Directorate.—The following statement gives the dates of the commencement and completion of the sarf operations in the different systems:—

NAME OF SYSTEM.	Sari operations commenced.	Surf operations completed.
Asyut Delgawi	9th October.	24th October.
Asyut Deirut E	8th	25th
Abnub	9th	20th

4th Circle.—The sarf operations along the Yusufi canal from Deirut to Kosheshah are very interesting owing to the absence of the artificial wave, which was formerly created by cutting the tarrads of the eastern Minia basins, now converted to perennial irrigation. Mr. Clowes writes as follows:—

"Delgawi basin was let go on the morning of 9th October, but owing to the usual amount of water not being in the Yusufi, because of the non-flooding of the sahels between Deirut and Masraf Delgawi, the necessary level of 45.20 in the Yusufi below Delgawi escape was not reached until 10th October, and this was only obtained by sending a flush of 30 cent. down from Deirut for 24 hours, the levels there being raised from 45.30 to 45.60, Hod Tanah was let go on 9th October.

The surf wave passed down the Yusufi and the crest of it reached the main regulators on the following dates :-

Naziet-el-A	hid	* + +	***			 	13th	ter	liith	October
Carlma			***	4 0 0		 	17th			
Lakara			0 = 1				19th			
Latititi()				000	0 0 u	 	24th	Ter	Zith	0.9

"Nazlet-el-Abid Lock and Regulator were fully opened on the afternoon of 12th October. The sahels along Hods Tukh and Qamadir were flooded by means of Hoshahs, to fill which and not to delay the sarf, numerous cuts were made, namely three in Tukh Tarrad on 11th October, and five in Tarrad Qamadir on 13th and 14th October. For the sahels north of Salibah Shushah, it was found necessary to cut tarrads Shushah and Tirfa on 16th October; the escape of Hod Tirfa on to the Yusufi was opened on 15th October, and El-Der Escape fully opened by 18th October.

The Saquia Lock and Regulator were fully opened on the afternoon of 16th October; Tarrad Hariqah was cut on 17th October for flushing the Yusufi sahels, and the Shenara and Delhanis escapes were opened on the same date.

No Shuraki on the Yusufi was left throughout the Asyut and Minia provinces.

Mazurah Lock and Regulator where fully opened on the afternoon of 18th October, and, as a level of 31.20 was obtained downstream on 19th October, no sharaki was left on the Yusufi in the Beni-Suef province.

Hod Kosheshah began to feel the sarf wave of the Yusufi from 16th October, and from this date rose rapidly, and, because of the high levels in the river, it was found necessary to check this rapid rise of

the basin by partially opening the Kosheshah escape.

No sarf wave was required in the Nile for Lower Egypt, and the increase of river levels was limited to a flush of 30 cents giving a river gauge of 25.80 below Kosheshah escape: thus in order to get rid of the surplus water coming down the Yusufi, it was necessary to takhfif on the Kosheshah escape before the basin reached its T.R. level. On 22nd October eight of the lower gates were raised, and on 23rd ten gates were open, and on 24th and 25th fifteen gates. As the Nile rose at the escape, and the difference of the up and downstream levels was not more than one metre, it was found possible to regulate with the lower gates and the basins was kept at T.R. level from 24th to 29th October. The flush in the river from 22nd to 23rd October being only 21 cents and the river levels commencing to fall away rapidly, the basin was easily discharged from the 24th October.

"When it was found that Hod Kosheshah was full, and the supply for Gizah through Komi could be maintained, the four Hods Sultani, Nina, Nuera and Bahabshin commenced their sarf on to Hod Kosheshah from 29th October, by which date the wave in the Yusufi had diminished, as indicated by the Lahun gauge, where the fall commenced from 28th October. Hod Riqqah was brought to T.R. level on 20th October and from 22nd October Komi bridge was opened to supply Gizah, the downstream levels being:—

The Hod Riqqah was sarfed in the usual way.

Regulation between Circles.—Between the 5th Circle and Girga directorate no regulation was necessary.

Between the Girga directorate and the Asyut barrage directorate regulation was made on the Gebel Asyut in the usual way.

Between the 4th Circle and 3rd Circle all former rules for regulation were cancelled and the following substituted, viz:—

4th Circle.—From the commencement of the flood the El-Komi bridge was completely closed.

3rd Circle.—From the commencement of the flood the supply for the Gizeh lasins was taken from the Gizah canal, which was kept fully open.

3rd and 4th Circles.—As soon as Hods Kosheshah and Riqqah were full, the Komi bridge was opened to complete the Gizeh basins according to the demands of the 3rd Circle.

Mr. Clowes points out how necessary it is that the Hoshahs in the Gizeh province should be always ready by 10th to 15th October, so as to allow Komi Regulator to be opened as soon as the Yusufi water can be spared from the Kosheshah basin, instead of opening the Kosheshah escape on to the river, where the levels are necessarily limited. I entirely agree with him, and would fix 15th October as the latest date for opening the Komi Regulator, i.e. that the Gizeh hoshahs and basins should be ready to take water on that date, if any is required, and the 4th Circle is prepared to give it.

Regulation at Deirut and in Yusupi.—Mr. Clowes, Inspector 4th Circle, has submitted the important and excellent diagram, Plate III, showing the flood regulation in the Yusufi from Deirut to Lahun during 1903, and the following useful information.

To obtain necessary flood levels at Deirut namely 46.75 in the Deirutiyah, 46.40 in the Yusufi, and 45.20 in the Ibrahimiyah below

Deirut regulator, it is necessary to have a level of 50.90 to 51 above the Asyut barrage.

In 1903 a level of 46.40 was first obtained in the Yusufi on 24th August, when the level above the Asyut barrage reached 50.96 on the 23rd August.

It is not possible to run a higher level in the Yusufi than 46.40 or perhaps 46.50 without flooding the sahels ketween Deirut and Badraman, and from the diagram it will be seen that there is very little water to spare north of Mazurah beyond the Fayum requirements, if Gizeh basins, when converted, are to be feel from Lahun. The amount available is that which now enters Hod Kosheshah, which will not be required when Kosheshah is converted to sefi, as it will receive its supply from the Ibrahimiyah at Sharahnah. Furthermore when the west of Yusufi basins in Beni Suef are constructed, a higher level above Mazurah will be required during September, but this can be obtained by not letting Nezlet-El-Abid upstream reach its T.R. level of 40.50 till 15th to 20th September instead of from 25th August as in 1903.

A supplementary supply can also be given to the Yusufi through Hod Delgawi, although a higher level than 46.40 cannot be run in the head reach of the Yusufi between Deirut and Delgawi escape.

When the Ibrahimiyah canal is commanding all the converted basins of Minia and Beni Suef provinces, through the Sabakah and Sultani canals respectively, it will be necessary to have flood rotations, and this will also be advisable to reduce the amount of drainage water.

Regulation during flood for drainage.—During the past few years arrangements have been made to discharge the drainage in the Minia province in flood direct on to the Bahr Yusuf, as long as the levels of the latter would permit; during the passage of the sarf wave, however, the levels of the Yusufi are higher than those in the Main Muhit drain, and, consequently, the outlets must be closed with the result that water accumulates in the drains, and great pressure is felt, especially in the Feshn discrict, where it is difficult to keep the drainage water from swamping the crops. In spite of all instructions, it is impossible to prevent the cultivators from allowing the surplus water of their irrigating channels to escape into the drains: it was decided, therefore, to adopt special measures of regulation.

Mr. Clowes thus describes what was done.

To relieve the Minia province drainage north of the Etsa Pumping station while the Yusufi sarf was in progress, the Ibrahimiyah canal was lowered downstream of Deirut on the 11th October from 45,30 to 44.70 and kept at that level until 25th October. All branch canals on left bank of the Ibrahimiyah were closed north of Minia to Sharahnah during those 15 days, and no complaints were received for water in this The reduction of the drainage was completely area for irrigation. successful and fortunately the drains were comparatively empty when the breach occurred in the Muhit bank on 16th-17th October, north of Abu Rahib, the discharge from which would have swamped out the Feshn district.

The Abu Rahib drainage escape was closed on 7th October as the Yusufi levels rose above these of the drain on 8th October; the Mazurah drain was closed on 17th and 18th October reopened on 19th October, reclosed on 20th, and again opened from 21st October, and remained so to the end of the year: from 17th October to 5th November, however, the discharge from it could have been but little as the levels in the Yusufi during that period were above 39.90 downstream

of the Mazurah regulator.

Further relief was given to the drainage of Feshn by cutting the sadd in the Absug Brain at Sharahnah on 3rd November, and letting that branch drain discharge out into the Nile. With a system of rotations during flood on all canals in Asyut and Minia of the old perennial area, and of the converted basins, it will be possible to keep the Mazurah drain low, and probably working continuously except during the period of the passage of the Yusufi sarf, when it will be advisable to close down all the canals for a period of a week or 10 This very important regulation will be repeated next year, and if found successful, it will be possible to do away with pumping stations in this reach altogether.

Sharaki expenditure.—In making Hoshahs and other special works for preventing sharaki the following expenditure was incurred:-

Special low Nile credit 897 In the 5th Circle... ... ... L.E. GSU In the Girga Directorate... ... Ordinary budget 139 In the Girga Directorate... ... ,, In the 4th Circle... ... ... ... 1724 Total ... L.E. 3440

Sharaki areas.—The only areas left unirrigated were in the isolated basins of the Aswan district, and on high islands and sahels in the river, the total of which should not exceed 5000 feddans; parts of this will probably be irrigated by lift during the winter.

Accidents and breaches during flood.—The breaches which occurred were:—

(1) Left bank of the Ibrahimiyah canal at Beni Mazar on the night of 25th August, due to the negligence of the cultivators in not protecting a private outlet. Water was pumped out of the birkets in the village by a staff and pump sent down by the Asyut barrage directorate: practically no damage was done.

(2) Breach in Tarrad Hod Qayat opposite Ezbeh Nagagi Pasha on

23rd September, which was quickly closed.

(3) Breach in Yusufi East Tarrad (on Muhit bank) north of Abu Rahib escape, due to negligence of watchmen. It was soon closed and as the Muhit drain had little water in it at the time, because of the closure of branch causes of the Ibrahimiyah north of Etsa for 15 days, no damage occurred to the low lands at Feshn: this was mainly due to the satisfactory working of the Mazurah drain.

Accidents.— At the end of the year, it was found that a large piece of the extension of the downstream floor of the Deirut escape had been completely broken up; the necessary repairs and the division of the lock into two bays, estimated to cost L.E. 6500, will be carried out in 1904.

#### SECTION IV .- FLOOD WATCHMEN.

Nile Corvée.—The total number of men called out was 17,651: the average number of days they remained out was 56; the total number of days labour was 992,132. The following statement gives the distribution of the men in the different circles. In the Projects Circle the men were called out for the protection of the banks of the new canals, in connection with the conversion works of the Minia basins.

E LINE 2311 Time popular House to Talmar THE SELL TO I E P 1 2 2 T 73 JEHRHEL ZHEDIAY 1 -N. P. I Time (exprise) 1881 T 8.9 27 nom prasquir s enen los papier 11-1 - 21 20 21 1 1 to Japania affectar & 1191 12 100 Zenning of bridges. 1 Butter ac. THE STOP IN FLOOR OF 1903. 3325 =15 1. 5 1-1 "QUEST PROPERTY 見り 表示 3 7 6 13651 241.17 135.5 Kunther of main Average minister of overlier bisometre, == 50 → 50 000 I - 01 1 :: 1 H\$SES. 3701 A COMMENTS Nale 13 1111 ł admit he Immed Cassal the sigh in THE 見し二番 1 50 1 19 5 1 -: tim failini 福金生物 LUL 5 1 H.HINE 1995 11 Namber of med per and terms affer any 2002 E -1 21 -00 1 LIC Hanna spinist of the state of 1981 RE 1 CALLED Hants Section of the Asset to 3863 -77 18.0 1 ---1 MEN The profits BERRE 22311 14 15. 1-10 Settles. ı to the property Average number of 1 10 70 1-OF CONYER 1 Ī --01 01 1 edited to district. HINKA 1251 1 Ž X E 1 Average minutes A NILL. 1848 1 --SE 1 × NUMBER like farffille 1. 3. I MERE 2000 100 7 that he reality 1 1 1 1 HEE . . . PROVINCIAL Total Total PERECTORATE. Total Testal 1111 CHECKE. denni. 1 ANI 111: BARRAGE CHETS ... GIRGA South Boni Suet Minin ... Asynt Norl Kens Oleyn ARITH

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#### SECTION V.-DRAINAGE.

All new drainage channels made during the year will be described under the head of special works.

In the clearance of drains 267,330 m.c. were executed at a cost of L.E. 3,413.

The Etsa Pumping Station was worked during the flood of 1903 for the first time; as the station was still under the Project Circle its working will be described under the head of "Special Works".

Levels of Lake Qarun.—The following table gives the levels of Lake Qarun on the 1st of March for the past 20 years.

YEAR. Level of lake in metros below sun-lovel.		Fall in province 12 months.	YEAR	Level of lake in metros below sen-level.	Fall or rise in previous 12 montus		
1885	39.89	Unknown.	1895	44:17	0:33		
1886	40:00	(),2()	18567	11.16	O'll rise.		
1887	40.38	0.38	1897	44.27	0.11 fall.		
1888	40°73	0.35	1508	14:32	0.02		
1889	41.17	0.44	1899	11-25	0°07 rise,		
1890	42(10)	0.83	I 540 % b	44*10	0.12 "		
1891	42.78	0.78	1901	4350	0.50		
1892	43:32	0.24	1102	44.19	0°29 fall.		
1893	43.78	0.46	1903	4 # 43	0.24		
1894	43'84	0.06	19631	41.72	()****		

There would seem to be little danger of an appreciable rise in the level of the Lake, notwithstanding the increased supplies entering at Lahun.

#### Part II.-RESERVOIR WORKS.

#### SECTION I.—EXPENDITURE.

The total grants made for the Reservoir Works are as follows :-

Original allotment	£st. 2,000,000 or 1,342,263	1,950,000 1,308,706
Total	£st.3,342,263 or	L.E.3,258,706
The total expenditure was as follows To Messrs. Aird & Co. up to Final	: :	
Cost of materials taken over by Go-	3,320,272 or	3,237,265
vernment	6,053	5,902
Total	£st.3,32,6325 or	L.E.3,243,167

leaving a balance of L.E.15,539 which was used for payments of land, etc., expropriated.

The total expenditure of L.E.3,243,167 may be approximatively divided as follows:—

Aswan Reservoir Dam and Locks Asyut Barrage and Ibrahimiyah Cana	Head	• • •	***	2,370,081 873,086
	Total	000	***	L.E.3,243,167

Although a complete delivery of the works to the Government was made on 10th December 1902, the final payment to the contractors could not be made, according to the specification, until two months after the completion of the works.

A final payment was made to Messrs. John Aird & Co. by certificate No. 55 on 4th April 1903, amounting to £st.3,320,272 or L.E.3,237,265.

The following statement shows the yearly and total expenditure in pounds sterling on the Reservoir Works during the years 1898-1903, according to the payments made to the Contractors.

STATEMENT SHOWING THE EXPENDITURE ON RESERVOIR WORKS TO END OF 1903.

			Expe	mditu	re in		
	1898	1899	1900	1901	1902	1903	TOTAL
	4	K.	E	R	2	#	£
Permanent work, Aswan Dam	20,886	273,075	567,016	840,921	298,560	1,514	2,001,971
Rotention under clause 39 of Spe- cification	3,132	20,204	004		-	33,000	-
Payment on account of Ferma- nent work	17,708	243,811	586.412	840.921	20R.500	34,514	2,001,971
Advance on Preliminary works, Aswan Data	20,729	72,746	71.029	138,202	26,212	_	_
Advanced on Plant	31,040 25,376	98,545 142,819	8,915	56,844 187,916	75,958	_	_
Advanced to Messrs Ransomes and Rapier	-	55,972	69,133	100,093	(46,748)	16,491	945,037
Total payment on account of Aswan Dum	94,898	588 887	718.844	611,862	274.312	51,045	2,317,008
Advanced on account of Asynt welr and Lack	16,024	274,917	240,765	202,740	75,960	S(A)	849,544
Advanced on account of payment for land	28,100	12.100	1,54H)	Баян	-		10,500
Advanced on account of Import	8,100	ES,INHI	13,000	9,000	1,240	-	17,701
Subsidiary works	8,984	8,731	1,315	1,526	1,960	699	15,467
Total det.	176.357	883,535	1,000,293	858,328	350,00£	80,767	8,330,272

From the commencement of the preliminary studies the total expenditure on the Reservoir Works, exclusive of permanent establishment is as follows:—

Expenditure as shown above 3,243,167 Preliminary surveys, and preparation of
Preliminary surveys, and preparation of
4 2 1 4
projects 1891 to 1897 inclusive 18,673
Temperary establishment, permanent build-
ings, maintenance &c., 1898-1903 84,319
3,346,159

The two last items were found from the orninary budget.

In addition to the above the Finance Department contributed on account of the Reservoir Works, for land and property expropriations and compensation, a sum of L.E. 124,346 so that the total expenditure from the commencement to the completion becomes L.E. 3,470,505.

Since the commencement of 1903 the Asynt barrage works have come under the newly formed Asynt Barrage Directorate, and from the commencement of 1904 the Aswan Reservoir Directorate has also been created, and separate allotments in the ordinary budget, under Chaps. IX. 8.4 & IX. 10.4 respectively, have been granted. At the end of December 1903 the extraordinary expenditure on Reservoir Works ceased, and in future the expenditure will be shown under ordinary budget.

# SECTION II.—THE ASWAN RESERVOIR. (Filling and Discharging the Reservoir).

Filling.—For the season 1902-1903 the filling of the reservoir was commenced on 20th October 1902 and continued till the end of January 1903, when the full level of R.L. 106:00 was reached. In last year's report the reasons for this early filling are given, and it is also stated that "it is certainly not advisable to repeat this programme except under similar conditions" on account of the silt deposit which might result. As far as can be ascertained the silt deposit has been very little, at all events not sufficient to appreciably diminish the contents of the reservoir: whatever silt is deposited, seems to a great extent to have been scoured away in the following flood.

Fortunately it has not been found necessary, owing to the better supply in the river, to commence filling for the season 1903-1904 till the 1st December, and to complete it by the 12th March.

From 1st February to 10th March 1903, the reservoir was kept full, and the river supply passed through the upper sluices.

Discharging.—On the 15th March 1903 it was decided, owing to the low levels in the river, to commence the discharge in order to supplement the supply of the Ibrahimiyah canal and to maintain the levels required for Lower Egypt.

On the 1st May the demands for Lower Egypt commenced and rapidly increased towards the end of the month.

The following quantities were discharged from the reservoir and added to the river supply.

From	March	10th	Ė	March	26th	1	million	cube	metres	IM-L	day
0.0	49	26th	4.0	May	Ist	• 3		**		71	7.0
7.9	May						17	**	31	79	0.0
9.9				June			3.7	••	23	0.0	9-9
99	June	3rd	9.9	g.e	25th	30	**	9.0	0.1		

At the end of June the rise from the south commenced to reach the reservoir and maintained the levels in the river which had been artificially produced by the discharge of the reservoir water. The discharge of the river itself in June was about 20 million cubic metres per day, so that the reservoir discharge practically doubled the available supply at the most critical time for the irrigation of the summer crops.

The filling and discharging of the reservoir entails an immense amount of calculations and diagrams, constant watching of the river levels, and careful manipulation of the sluices of the Dam. Considering that this was the first year of the reservoir's existence, and that there was no previous experience of its working, Messrs. May and Macdonald and their staff deserve great credit for the successful regulation of the supply.

Results of the working of the reservoir.—The levels in the river south of Halfa were very low during the latter part of March, throughout April, and May, and the early part of June, in fact lower than the exceptionally had levels of 1902, as shown on Diagram I: without help, therefore, from the reservoir the supply would have been quite inadequate for the irrigation of the summer crops, and great difficulty would have been experienced in saving the cotton crop.

The result of the discharge of the reservoir was to give an ample supply in Middle and Lower Egypt at least one month earlier than would have been the case without the reservoir: the rotations were everywhere relaxed early in July instead of the middle of August: the prohibition to irrigate the land for planting the dura crop was removed one month earlier than had ever been done in previous years; the irrigation of rice, which had been prohibited in previous years, was again allowed; and, finally, the whole cotton crop was plentifully irrigated.

In Middle Egypt 170,000 feddans of basin lands were converted to perennial irrigation, thus giving an increased annual rental of LE.500,000 and an increased value of the land of L.E. 5,000,000.

#### SECTION III.—THE ASYUT BARRAGE.

Regulation for purposes of navigation was commenced on the Asyut barrage on 20th March: afterwards it was continued for irrigation.

The greatest head on the Barrage was 1.30 m. on 2nd April, the up and downstream levels being R.L. 46.95 and R.L. 45.65 respectively: the Barrage was fully opened on 14th August.

The results of the regulation are shown in Part I. Section 1 of this report.

#### SECTION IV. -SUPPLEMENTARY WORKS.

New Sahel Lock.—In order to improve the navigation in the river between the Aswan dam and Aswan town, it was decided at the end of 1902 to construct a new lock at the Sahel rapid, where boats experienced great difficulty in passing. The work was put into adjudication and entrusted to Messrs. Williamson and Urquhart, who successfully completed the work in one season, so that the ironwork was all fixed to enable the lock to be worked in July 1903. The ironwork was supplied by Messrs. Ransomes and Rapier, and is of their usual excellent quality and workmanship.

The total cost of the Lock was L.E. 49,331, which was made up as follows:—

			L.H.	
			25,(BR)	
005			15,539	
			6,993	LaE
				47,532
004				1.799
Tota	al	***	L.E.	49,331
	000		 Total	25,000 15,539 6,993

The Lock has been quite successful, and when the lateral banks have been completed, navigation should be perfectly safe at all seasons.

Apron downstream of the Dam.—In order to protect the river bed immediately under the upper sluices of the Dam and prevent erosion at the toe of the wall, it was decided to put in a masonry apron. On the western side the work was completed before the flood at a cost of L.E. 5,474, which had been advanced by the Finance Department and is to be recovered from the Caisse Grant in 1904.

Philo Temple.—No expenditure was incurred during 1903. The Caisse Grant for the consolidation was L.E. 19000 and the expenditure L.E. 12,007 leaving a balance of L.E. 6,993 which was utilised on the New Sahel Lock.

## Part. III.—SPECIAL WORKS.

(Chargeable to Special Caisse Credit and Special Grant from Ordinary Budget).

The sum available for expenditure on special works during the year

was as follows :-

Special Caisse Grant		404	***	 4 + 4	423,436 15,138
	Total				E. 438,574

The total expenditure was L.E. 438,456, leaving a balance of L.E. 118 to be carried forward, or, excluding the balance on the Ordinary Budget, which will lapse, L.E. 117 only.

In addition to the above the Finance Department made the following advances, which are to be recovered from the Special Caisse Grant

of 1904, viz :--

## Conversion Minia basins .-

Works Land	 400	***	 * * *	***	9 6 6	 * * *	***	***	# 4 A	38,133 64,756
						Tota	ıl			LE. 102,889

Of this amount L.E. 38,133 were spent on works and L.E. 22,578 on land, leaving a balance of L.E. 42,178 for land payments in 1904.

The total amount available for expenditure was, therefore, as follows:-

Special Grants from Cuisse and Ordinary Budgets	438,574 102,889
Total 1.	E.541.463
and the expenditure was as follows:-	
	L.M.
On Advances by Finance Department	438,574 55,806
Totul 1.	.E. 494,380

Leaving a balance of L.E. 47,083 to be carried forward to 1904, or, excluding the Ordinary Budget which will lapse, L.E. 47,082 only. This balance will be paid in 1904 for land, for which all formalities were not complete in 1903.

Appendix F. gives a general abstract showing the distribution of the expenditure on the various projects namely:—

#### 4th Circle .-1.2. L.E. West Hafiz Gannabiyah... ... ... ... ... 65 Waladiyah Syphon ... ... (300) 440 440 Asynt converted basins ... ... ... ... 3,790 Fayum remodelling projects ... ... ... 67,882 ----72,346Projects Circle. Asynt basin conversion ... ... 3,100 Southern Minia basin conversion ... West Gizeh 60,002 ... 154,079 West Gizeh Enlarging Ibrahimiyah canal Remodelling Muhit Draiu .... 4,740 ... 101,510 ... ... ... ... 52,750 1 1 0 Etsa Pumping Station ... Establishment. Temporary and Contingencies... 15,955 418,034 5th Circle .-4,000 (HH), E

The appendices G and H give the details of the expenditure on the various masonry works, new channels and banks constructed, and existing channels re-modelled during the year.

Grand total... ... I.E. 494.380

The following note gives the details of each project taken in hand, or advanced during the year:—

4th Circle.—West Hafiz Gannabieh.—The small sum spent was for land, the project having been completed in 1902.

Walidiyah Syphon.—The expenditure of L.E.600 was the balance due on work done in 1902. The pipes were re-sunk, but the end lengths could not be attached, owing to heavy slips of the canal bank when excavating the pit, and the early rise of the flood stopped completion of the work. It has been decided to raise the pipes, and re-sink them in 1904, with parts of the end lengths already attached.

Asyut converted basins.—A sum of L.E.3799 was spent on a few small branch canals and drains found necessary after the first year of working of the sefi canals in the newly converted basins, and in the construction of five small masonry culverts, and three road bridge regulators. Some iron pipes were also provided in drains where village roads crossed them. Two iron pipes were also fixed under the Muhit bank to drain two local depressions on the west of the Muhit in Hod Itqa into the Muhit drain.

This project has now been completed and handed over by the Project's Circle to the 4th Circle. The total expenditure in converting 58,085 feddans from basin to perennial irrigation, excluding the widening of the Ibrahimiyah Canal, Muhit drain and Etsa Pumping Station which will be spread over the whole area of Middle Egypt, is L.E.184,081 i.e., the cost of the actual conversion works in the basins becomes L.E.3.17 per feddan of converted area.

Fayum Remodelling Projects.—The total expenditure on new works in the Fayum during 1903 was L.E. 67,882 of which L.E.2,526 was for establishment and L.E.65,356 for works.

The projects taken up or advanced were :-

Canals.

Completion of 2nd Reach of Abdallah Wabbi Canal and branches.

Excavation of 3rd """ """ ""

Bahr Serb and branches.

Remodelling Bahr Makatalah and branches.

Serb Drain.

Remodelling drains of Bahr Seilah.

Masonry falls below Khazzan Tamiyah.

The expenditure was as follows:-

#### Canals.-

Land Earthwork Masonry works	***	***	400	> 0 q	• • •	***	L.s. 1,652 35,374	
Masonry works	***				0.0-	4 = 0	13,650	
Ironwork in bridges	and	Inline				200	1,312	
Rubble revetment					004		803	
Demarcation stones				***			40	
Drains.—								52,831
Earthwork			101				LE.	
M 2					***			
Masonry Works		0 7 0					4,420	
fromwork, pipes, &c.	0.00					100	445	
Khazzan Tamiyah							9 16 16 9	
								12,525
				T	Tarker		1.1	the orea

At Tamiyah there has been in past years a small lake covering an area of 200 to 300 feddans, held up by the old masonry walls across the deep khor. Owing to the high level of water in this lake all the Serb, Rodab, and Rubiyet lands were considerably affected and could not get efficient drainage. It was decided to run off the water in the lake, and in future to maintain such a level above the Tamiyah Khazzan that would allow all the drains of the affected lands to work properly. Two wrought iron pipes, each of 1.50 metres diameter, were placed through the old retaining wall of the lake, and necessary masonry falls were constructed below. The sadd above the work was cut in October, and the lake lowered to the required depth.

The whole operation was neatly and most creditably carried out and

the results have been quite satisfactory.

#### PROJECTS CIRCLE.

Conversion of Southern Minia Basins.—The conversion project for hod Tahnashawi, Quran, and Tahawi, forming the southern Minia basins, and comprising an area of 51,897 feddans, was carried out in 1902 and the canals were opened early in August of that year. During the flood the experience of the working of the canals showed what further works would be necessary to complete the system. These works were carried out in 1903 and consisted of clearances of canals, strengthening banks, excavating new channels, construction of head sluices, regulators, escapes etc.

Altogether the following were executed:-

Clearance of canals	196	224	195,151 M.c.		2572 L	
Strengthening banks			289,393		3907 8212	
Masonry work			72 No. 1372 Lm.	10	334	0-4
Outlets pipes Reverment Bahr Yusef	8 8 8	0 00	5222 M.e.		1854	

The new canals and drains and their extensions aggregated a total of 374 kilometres.

The total expenditure, including cost of land (L.E.37,029) incurred in 1903 was L.E.60,002. Adding this to the L.E.155,541 spent up to the end of the previous year, the expenditure to date becomes L.E.215,543. The estimated further expenditure for land, outlets, etc., is L.E.77,747, so that the total expenditure to complete the project becomes L.E.293,290, or L.E.5.65 per feddan converted.

Conversion of Northern Minia Basins.—The conversion project for Hods Deri, Mangatin, Membal, Bardanuhi, Garnussi, and Salaqusi forming the Northern Minia Basins and comprising an area of 55,433 feddans was carried out in 1903. The works were commenced in Jannary, and water admitted to the canals on 10th August.

The	total	length of irrigation channels	W88			310 kilometers
9.0		drainage	64 010	444	***	230
29	79	number of masonry works	** ***			293 No.
See	22	cube of earthwork	22 ***			5,749,981 M.e.
**	0.0	cost of earthwork				99,815 L.E.
91	8-9	musonry works				50,037

The total expenditure amounted to L.E.154,079.

To complete the project, including the cost of land, it is estimated that a further expenditure of L.E.77,670 will be necessary, making a total of of L.E.231,750 for the conversion of 55,433 feddans or L.E.4,18 per feddan of converted area.

Conversion of Hods Kom Saaydah, Sultani, Nina and Nucra.—The conversion project for these basins has been drawn up and approved. It has been decided to carry out the conversion of Hods Kom Saaydah and Sultani in 1904. In order to irrigate the sahel of the Bahr Yusuf in Hod Kom Saaydah an extension was made from the tail of the Sabakhah Canal to feed the Belhasa Canal at a cost of L.E.1.171.

Conversion of West Giza, Hods Qoshesha, and Riqqah.—The project for the conversion of these basins was studied and submitted in 1903: it consisted of the conversion of the whole tract into Sefi conditions. It has now been decided to modify the project, and to keep the western part, situated between the Lebeni channel and the desert under basin irrigation; the modified project is now being prepared. For the proposed Lahun Canal through Hod Qosheshah for supplying the Giza Province with sefi water (a part of the modified project) 21,380m.c. of rubble stone was collected at a cost of L.E.4,490. A sum of L.E.250 was also spent in printing the map of West Giza.

Widening Ibrahimyiah Canal.—In order to supply the converted basins of Minia, Beni Suef and Gizeh Provinces, it is necessary to widen the Ibrahimiyah Canal from Deirut to Ashmant, a length of 207 kilometres, and of which the following have been taken in hand, viz:—

- (a) Deirut to Minia... ... Length 66 kilometres
- (b) Minia to Matay... ... ... ... ... 40
- (c) Matay to Mayanah ... ... ,, 30 ...

With the exception of the first section, which is being executed by dredgers, all the rest of the canal is widened by hand labour during a closure of 30 days in December of each year.

Deirat to Minia.—In October 1902 a contract was made with the Behera Company for hand work and dredging at an all round rate of 32 millions per cubic metre: the work is to be completed by 1st December 1905. Handwork was commenced in December 1902, and dredging in May 1903. Considerable progress has been made with the hand work, but, owing to unforeseen difficulties, the cube dredged has been unsatisfactory, and in order to assure the completion of the work and not delay the conversion works in the basins, it has been decided to execute the greater part of the length between the Hafiz and Minia regulators during the closure of the canal in December 1904 and 1905. The quantities executed to date are 839,295m.e. of hand work and 231:400m.c. dredging: the total expenditure to date is L.E.33,999.

Minia to Matay.—The work in this reach, part of which was carried out in the previous year, was completed during a month's closure from 15th December 1902 to 15th January 1903. The expenditure during the year was L.E.51,333.

Matay to Mayanah.—The drywork only was executed from January to July 1903; the expenditure was L.E.17,274.

The wetwork was commenced during the closure of the canal in December 1903 and completed in January 1904, but no payment appears against the Budget of 1903: about 10,000 men were employed. The work has been excellent, and most creditable to those concerned: where completely finished, this magnificent canal can vie with any existing.

Altogether the expenditure on widening the Ibrahimiyah Canal has been up to date L.E.165,035.

Remodelling West Muhit Drain.—The West Muhit Drain is the Main Drain for the newly converted basins of Asynt and Minia, as well as the old perennial area. It has been widened and remodelled from the Sabakhah Canal to Sharahna, a length of 123 kilometres, and is now a most excellent and efficient drain. From Sabakhah to Etsa the remodelling was done in 1902.

From Etsa to Sharahnah, a length of 86 kilometres, the work was done in 1903, and with the exception of some bed clearance, which will be completed in 1904, was satisfactory. The expenditure in 1903 was L.E.52,750; and altogether L.E.79,431 has been spent up to date.

Etsa Pumping Station.—In the drainage project of the tract situated between the Nile and the Bahr Yusef from Deirut to Etza, was included a pumping station at the river end of the Etsa Nili Canal, in order to pump the drainage water into the river during the flood, when the level of the river would not allow the drains to work freely.

In September 1901 a contract was signed with Messrs. Easton & Co. Erith, Kent, for the supply of the neessary plant, consisting of four vertical direct acting engines of 165 I.H.P. each, four Easton centrifugal pumps of 40 inches diameter each, six boilers with a working pressure of 125lb per square inch. and all accessories. In May 1902 a contract was made with Messrs. Zaffrani, Annigoni and Gandolfi for the construction of the necessary buildings, with the exception of the two chimneys which were entrusted to Mr. Alphons Custodie of Dusseldorf.

At the commencement of August 1903 the whole installation was completed, and un-official trials were started of each engine, which were found satisfactory.

The pumps were worked continuously for lifting drainage water into the river from 6th October to 15th November, each engine running an average of 700 hours.

On 11th December Mr. Crawley commenced the official trials which lasted three days; he has submitted an excellent report on the results of these trials. Although the actual levels specified in the contract could not be obtained, and the slide valves had cut so badly that engine No. 4 had to be stopped before the completion of the trials, yet there is no doubt that the pumps can deliver 2 c.m. per second with a lift of 4.5 metres and 115 revolutions of the engines, and a coal consumption of 1.85 lbs. per H.P. per hour according to the specification.

Mr. Crawley has pointed out certain defects in the machinery, the most serious of which is the cutting of the valves and cylinder faces which he attributes to the bad quality of the material supplied: a sum of L.E.1,000 has been retained to rectify the defects, as far as possible, but Mr. Crawley is of opinion that piston valves should have been specified, and it is more than probable that it will be cheaper in the long run to adopt them, though the first expense will be somewhat costly.

With the exception of this defect, the whole installation has been well arranged and creditably executed.

The expenditure during 1903 was L.E.25,898 and up to date L.E.42,937: a further sum of L.E.2,200 is required in 1904 for the construction of quarters, coal store, tools, etc., so that the final cost of the whole installation will be L.E.45,137.

Cost of Conversion Works,—Exclusive of the cost of the widening of the Ibramiyah canal, remodelling the main Muhit Drain, Etsa pumping station, petty works and temporary establishment, the cost of the actual conversion works in the basins themselves is as follows:—

Asyut Pro	vince.—									
Original Revised Actual	estimate		0 0 0	***	0 0 t		6 0 1 6 0 0	2 2 2 3 3		per feddan.
Minia Pro	vince.—							7 32	M.	
Original		> m <		***	***		401	3	015	per feddan.
Revised Final	*9	200			***	***	***		055 089	**
Beni Suef ar	nd Gizeh	Prov	ince	.—				L.E.	M.	
Estimat	e		***		200		4 4 6			per fe ldan.

It will be seen from the above figures that the original estimates have been more than doubled, and L.E.4.000 to L.E.4.500 per feddan converted is the average price which it is estimated the whole of the actual conversion works from Deirut to the Delta Barrages will cost. The reasons for the increased cost are as follows:—

- (a) In the Asyut Basins the cost of land was L.E.30, whilst in the Minia, Beni Suef, and Gizeh Basins it will not be less than from L.E.45 to L.E.50 per feddan, owing to the great rise which has taken place in the value of basins lands since the commencement of the conversion works.
- (b) In the Asyut Basins the main canal of the system already existed, whereas in the Minia, Beni Suef, and Gizeh Basins, it has to be constructed.
- (c) Owing to the increased area of sefi cultivation, the cost of labour has very much risen throughout Middle Egypt: the Sugar and Cotton Factories have considerably felt this, as it is difficult to get ordinary labourers for less than 5 P.T. per day against 3 P.T. a few years ago. The increased cost of labour has naturally produced a corresponding increase in the cost of the works, which is shewn as follows:—

	Earthwork per cubic metre.	Mesonry per cubic metre.	Land per feddan.
Asyut Basins Minia Basins	L.E. 0.0125 0.0160	1.150 1.300	1E 30 45 to 50

In the Asynt basins the actual cost, per feddan converted, for the land expropriated was L.E.0.52: in the Southern Minia basins it becomes L.E.1.60, owing to the extra value of the land, and to the increased area required for the main canal.

Total Cost of Conversion Works,—As stated above the cost of the widening of the Ibrahimiyah Canal, remodelling the main Muhit Drain, and other works outside the basins themselves, has been omitted.

The following shows the total estimated cost of the Conversion Works in the Asyut, Minia, Beni Suef and Gizeh basins, comprising an area of 451,000 feddans and including all subsidiary works:—

Actual Conversion Works Widening and extension of Ibramiyah Canal Gizeh Canal from Lahun Drainage channels main Muhit and new main drain Pumping Stations Establishment and petty works for six years	 1,739,506 512,383 171,000 267,336 150,000 180,000
Total Contingencies Grand Total	 179,775

or L.E.7 per feddan converted from basin to perennial irrigation.

Result of the Conversion Works.—Up to the present 170,000 feddans have been converted from basin to perennial irrigation, and assuming the total final cost, as distributed over the whole final area of 451,000 feddans, to be L.E.7 per feddan, the expenditure will be L.E.1,190,000. The result has been to raise the rents at least L.E.3 per feddan and the value of the land at least L.E.30 per feddan in other words, by an expenditure of L.E.1,190,000 the increased annual rental is L.E,510,000 and the immediate increased value of the land L.E.5,100,000. Recent inspections show how very rapidly the cultivators, stimulated by the very high prices of agricultural produce now ruling in the market, have adapted themselves to the new conditions. In the first year very little sefi cultivation can be done, owing to the want of watercourses: in the second year more than half the area is under summer and flood crops: in the third year the whole area is under sefi conditions.

In the 5th Circle.—In making a new railway bank at Hod Hamad a sum of L.E.3,630 was spent and, in the Aswan District in minor works L.E.370, making a total of L.E.4,000.

#### Part IV.—WORKS AND ESTABLISHMENT.

#### SECTION I .- MAINTENANCE AND REPAIRS.

Details of the quantities of earthwork executed during the year and its cost, are given in Appendix D. The total quantities are as follows:—

CIRCLE	By h	int	Dredging.		
CIAL DE	Quantity.	Cost.	Quantity.	Cost,	
	C.M.	L.E.	U.St.	LE.	
4th Circle	3,865,990	48,045	-		
5th Circle	2,883,966	36,072	-		
Girga Directorate	2,069,749	23,062	_	-	
Asyut Barrage Directorate	638,388	7,323	100,000	8,914	
Totals	9,458,093	114,502			

In the 4th Circle and Girga Directorate there is a considerable reduction, owing to the transfer of works to the newly formed Asyut Barrage Directorate.

The Ibrahimiyah Canal from the head to Deirut, together with its works and dredging, has been transferred from the 4th Circle to the Asyut Barrage Directorate. Under the new contract with Messrs. Duport & Jones a minimum cube of 100,000 M² is guaranteed: the rate for this is 60 milliemes per cube metre for dredging and 10 milliemes for removal by hoppers making a total cost of L. E. 7,000. Making an allowance of L.E. 400 for lockage at the rate of 5 milliemes extra, the amount becomes L.E. 7,400 which has now been allotted under Corvee Abolition in the Asyut Barrage Directorate's Budget for 1904 and will be continued annually. If it is found that more dredging is required than the minimum cube of 100,000 M², then the 4th Circle must find the funds to do the extra cube.

In 1903 a sum of L.E. 1,600 was spent in carrying the dredged material to fill up the old diversion channel of the canal which was used during the construction of the Head Regulator.

Altogether, then L.E. 7,400 + 1,600 = L.E. 9,000 was transferred in 1903 from the 4th Circle to the Asynt Barrage Directorate.

Spurs in the Ibrahimiyah Canal.—There was no expenditure on spurs in the Ibrahimiyah Canal during the year.

River Protective Works.—The following statement shows the cubes of stone purchased and built into river spurs and revetment, during the year, and the expenditure incurred on transporting and building Government stone into the same:—

CIRCLE	SER :	TUST.	Transport and	Total Cost	
1111-1-22	Culas.	Cost	old stane.		
	CM.	1. K	F.a. 53.	ELE	
4th Circle	9:314-9	325	133	458	
5th Circle	2.312	370	12	382	
Girga Directorate	4,020	1,029	490	1,519	
Asyut Barr, Directorate	5,489	812	258	1,070	
Totals	14,222	2,536	8903	3,429	

In the 4th Circle L.E. 142 of the above was unpaid, and a further expenditure of L.E. 1,196 was incurred on 4439 M<sup>3</sup> of stone used in the protection of Badbit et Matahra, which was badly attached during the flood; these amounts will be paid in 1904. In the 5th Circle and Girga Directorate L.E. 407 and L.E. 220 respectively were spent in clearing off arrears of 1902; the former is not included in the above statement.

The following were the principal sites protected:-

4th Circle.—Wasta. Geziret El Masada & Head of Sultani Canal.

5th Circle.—Kasr Canal Head.

Girga Directorate.—Sohag, Qaramta and Kikata, Asynt and Sohag.

Asynt Barrage Directorate.—Mangabad, Abnub, Ekrad and Wasta.

The following expenditure was incurred in revetting canal banks below regulators and other important points:—

CIRCLE.	New:	STONE	Transport and building	00 . 3 /3
to a parte dallo	Cule.		Govi. Stone.	Total Cost.
	CM	1.11.	î.E.	4.2.
4th Circle	8,044	2,646	168	2,814
5th Circle	801	224	159	381
Girga Directorate	1,145	240	46	286
Asynt Barr, Directorate	3,826	765	_	765
Totals	13,816	3,875	371	4,246

The following were the principal points where revetment was done:-

Minia Province.—Canals Nazlet Diab and Etlidem, Nazlet El Abid Regulator on Yusufi.

Beni Suef Province.-Mazurah Regulator on Yusufi.

Fayum Province.—Bahr Seilah, Yusufi Canal at Fayum town, and various small canals.

Aswan Province.-Ramadi Canal.

Girga Province.—Bayyaras of several regulators.

Asynt Province.—Ibrahimiyah Canal, Delgawi-Yusufi bank.

In the Asynt Barrage Directorate 9,478 M<sup>3</sup> of stone were collected for the Asynt Barrage Reserve, at a cost of L.E. 1,660 in addition to the above.

#### SECTION II.—NEW WORKS AND IMPROVEMENTS.

(Exclusive of Special Works).

Earthwork.—The quantity and cost of earthwork executed in new channels and banks was as follows:—

CIRCLE	Cube.	Cost.
	C.M.	Lotte.
th Circle	202,631	2,894
th Circle	_	
lirga Directorate	47,491	639
synt Barrage Directorate	64,708	776
Total	314,830	4,309

The lengths of the new channels and banks are given in the following statement:—

	LENGTH IN	THOMETRES.
Специ	New Channels.	New Banks
4th Circle	46,691	2,014
5th Circle	-	-
Girga Directorate	9,014	0,984
Asyut Barrage Directorate	-	1,185
Total	55,105	4.183

The details are given in Appendix E: all the works were petty.

Basin Bank Protection.—Appendix K shows the progress made with and expenditure incurred on, revetting basin banks.

In the 4th Circle a length of 1003 metres was revetted on salibalis Quinadir and Shushah at a cost of L.E.1732. In the Girga Directorate 5493 metres of new revetment was executed at a cost of L.E.2852 and L.E.338 was spent of repairs to existing work.

In the 5th Circle and Asyut Barrage Directorate no basin bank revetment was done.

Owing to the conversion of the Asynt and Minia basins the banks have been suppressed and the stone used in the conversion works: the total up to date is therefore misleading, and will be adjusted when all conversion works are completed.

New Masonry Works for Irrigation.—A list of new masonry works and buildings charged to the Ordinary Budget is given in Appendix B.

In the 4th Circle the principal expenditure was on the Walidiyah Syphon, where the pipes were successfully sunk across the canal, but it was found impossible to connect the end pieces owing to a heavy slip of the Ibrahimiyah Canal bank round the wooden coffer dam constructed at the north end, and to the early rise in the river; the pipes will be raised in 1904 and the end pieces attached before they lowered. The expenditure was L.E.1162 and up to the date L.E.5503.

In the 5th Circle the two principal works were a regulator in Salibah Hod El Gabbana and El Maamal Sayyala Head for Hod Edfu, costing respectively L.E.300 and L.E.548.

In the Girga Directorate no new works were built.

In the Asyut Barrage Directorate two small regulators were built at a cost of L.E.443.

The total expenditure under this head was L.E.3200.

Masonry Works re-modelled and repaired.—A list of the masonry works remodelled or repaired is given in Appendix C. The total expenditure under this head was L.E.14,581.

The principal work undertaken was the repairs to the Talibat Regulator on the Sohagiyah Canal which had been outflanked during the previous flood: a sum of L.E.6357 was spent in its restoration, leaving arrears of L.E.520 to be paid in 1904; this regulator has stood well during the flood.

The rest of the expenditure was for the usual maintenance and petty repairs of masonry works and buildings.

#### SECTION III.-AGRICULTURAL ROADS.

Nothing was done in 1903 for the construction of new roads in the Fayum in connection with the programme drawn up in 1898.

These roads are purposely being held up until the main lines of canals and drains in the remodelling projects are fixed: the remaining

roads will probably be taken in hand in 1904. A small expenditure of L.E.3 only was incurred for land taken up in past years. The usual budget allotment of L.E.1050 was spent on repairs to old agricultural roads in the four provinces of the 4th Circle: this sum is quite implequate for keeping the roads even in decent repair.

In the Asynt Province a project for the construction of new agricultural roads to serve the converted basins was accepted by the Provincial Council in August 1903 and the Decree of Council of

Ministers giving final approval was issued in November 1903.

The total length of the proposed roads is 64 kilometres and the estimated cost L.E.19,250. The project was prepared by the Project's Circle, but will be executed by the 4th Circle.

In the Minia Province a project was drawn up by the Project's Circle for the construction of new agricultural roads to serve the converted basins. The project comprises 28 roads extending over a length of 259 ½ kilometres of which 171 ¾ are new and 86½ old. The estimated cost of the 172 ¾ kilometres of new roads is L.E.47,325 giving an average of L.E.274 per kilometre. At a meeting held at the Mudirieh in April 1903 the project was agreed to and it was proposed to spread the cost over the whole of the lands situated on the west of the Nile: the area amounts to 363,000 feddans and the share per feddan is L.E.0.135.—The project is now held up, pending the decision of the Daira Sanieh Administration regarding their contribution.

#### SECTION IV.—BRIDGES TO REPLACE FERRIES.

In the 4th Circle a new bridge with iron screw piles and masonry abutments was built at Abu Kerkas to replace the old wooden structure which had collapsed: its cost was L.E.1047.

A contract was also placed for the construction of a similar bridge across the Yusufi in the Fayum town, but no payment was made is 1903, though a considerable portion of the work had been done.

In the Project's Circle a new masonry bridge was built on the Ibrahimiyah canal at Sidds at a cost of L.E. 260.

A contract was also made for the construction of masonry and iron bridges on the Ibrahimiyah canal at Beni-Mazar, Abn, and Sheikh Ziad during the closure in December 1903: a sum of L.E. 1350 was spent on these, the balance is to be paid in 1904.

The total expenditure under this head was L.E. 2657.

In the Girga Directorate 18 bridges on masonry abutments and piers and steel joists carrying a wooden platform were built at a cost of L.E. 6555. Altogether 51 bridges have been built against the original programme of 49, and the balance of money available will be used up in building others. These bridges are paid for by a cess on the cultivated area of the Girga Province.

## SECTION V .- WORKS OF PRIVATE ENTERPRISE.

Agricultural Railways in Fayum Province.—During 1903 no new lines were made: some bad curves were eased and a short length of track doubled at Metartaris station: the telephone posts were transferred to the side of the roads on which the rail track runs.

Nile Land Reclamation Works.—Mr. Dempster, Chief Engineer of the Nile Land Reclamation Works Co., writes as follows on the works undertaken in 1903:—

"Garf Sarhan Reach.—A masonry needle regulator with 25 openings of 3 metres each has been constructed at the tail of this reach, by means of which the flow of water is under command and is regulated to the velocity best suited to the deposit of silt. The flood of 1903 was but a moderate one and barely rose high enough for our wants. However, about one part in every 1000 of discharge was abstracted from all the water passing through the regulator and fairly good results were obtained."

"Saudat Reach, near Mellawi.—Here a masonry regulator of 120½ metres, plus wooden girds 180 metres in length were constructed at the lower end of this reach. A much smaller percentage of the silt was deposited, though larger quantity in all was found within the reach, due to the much heavier discharges passed. Satisfactory deposits of pure clay were found at the lower end of the reach, though much sand was found at the top of the reach."

"Ro lah Reach.—Here also a masonry regulator 99 metres in length worked with wooden needles has been used to modify the velocities required for the best deposit of silt. A higher flood here, as at Garf Sarhan, would have suited our purposes better, but a good even deposit of pure clay has been obtained all over the reach. About 55 parts out

of every 1000 of discharge were measured as deposited in the reach as the results of this year's operations.

"Sheikh Fadl Reach—near Beni-Mazar.—A similar regulator as that employed at Rodah has been successfully worked in this reach during the year. The deposit has been fairly even and good, though much

sand is found towards the top end of the reach."

This Company has spent a considerable sum of money in the construction of substantial works, which, in addition to the reclamation of the land, have certainly improved the navigable channels of the river: a good many difficulties have been encountered, especially as regards the ownership of the land reclaimed, but with encouragement it is hoped the results will be satisfactory.

#### SECTION VI.-EXPENDITURE.

An abstract of the expenditure is given in Appendix A, and is as follows:—

Establishment Works				0 0 0 0 0 9	38,541 685,026
				L.E	. 723,567

#### SECTION VII.-ESTABLISMENT.

At the commencement of the year the post of Director General of Reservoirs was abolished, and the whole of the works came under the

charge of the Inspector General of Irrigation.

A new directorate was formed for the Aswan Reservoir with Mr. Macdonald as Director, and a staff of European engineers and mechanics. Similarly the Asyut Barrage Directorate, comprising the Asyut Barrage, and portions taken from Girga directorate and 4th Circle, was formed with Mr. Waghorn as Director.

Mr. Clowes, in addition to very heavy work in the 4th Circle, also held charge of the post of Inspector General during my absence on leave.

Mr. Ireland took charge of the 4th Circle during the flood, when Mr. Clowes was on leave, and carried through the complicated Sarf operations very creditably. At the end of the year he was appointed to the newly created Zifta Circle. He had a thorough knowledge of

the 4th Circle, where he was much liked and respected: his departure will be widely felt.

Sidky Bey and Hussein Bey Wassif held charge of the 5th Circle and Girga Directorate respectively throughout the year, and successfully carried out the flood irrigation.

Abdallah Bey Wahbi did very good work on the remodelling projects of the Fayum.

Ismail Pacha Sirri held charge of the Project's Circle throughout the year, and carried out most successfully the very heavy programme of works in connection with the basin conversion Projects.

A. L. WEBB.





# APPENDIX A.

ABSTRACT OF EXPENDITURE IN 1903 UNDER THE DIFFERENT SUB-HEADS OF THE BUDGET.

See Units on Byrone			EXPEN	DITURE.		
SUB-HEADS OF BUDGET.	Ith Circle.	Projects.	5th Circle.	Girgu	Asyut Bar, Dirte.	Total.
Sub-Chap. L.—Establishment.	L.E.	L.E.	L.E.	L.E.	L-E.	L.E.
Classified	8,942 5,265	1,870	4,359 1,340	3,741 1,163	886 1,990	19,798 9,758
Total, Sub-Chap. I	14,207	1,870	5,699	4,904	2,876	29,556
SUBCHAP. II.						
Travelling Allowance	3,628 227 131 239 10		1,358 234 461 40 49	1,192 156 148 460 18	223 18 — 286 5	6,401 635 740 1,025 82
Total, Sub-Chap. II	4,235	_	2,142	1,974	532	8,883
SUB-CHAP. III.						
Furniture and instruments	{2.}		40	67	_	170
Sue-Chap. IV.						
New works	228	_	1,189	(HH)	443	2,7(30)
Sue-Chap. V.						
Repairs and Maintenance	8,630	-	3,017	5,005	8.058	21,710
SUB-CHAP. IV AND CORVER ABOLIT.						
Earthworks and works for de-						
creasing the cost of mainte- nance of banks and channels Special new works	60,739 2,411	=	37,500	32,568	17.757	148,564 2,411
SPECIAL "CAISSE CREDIT."	69,935	419,645	\$,(N)()	-	_	493,580
NEW AGRICULTUR. ROADS & BRIDGES	3	-	-	6,555	_	6,558
SPECIAL LOW FLOOD CREDIT	-	-	897	681	-	1,578
FERRY FUNDS	1,047	3,500	_	_	-	4.517
Sums collected under Canals Act.	51	_	bo	101		251
Total of Works	143,044	123,145	16,702	45,810	26,258	684,959
Grand Totals	161,549	425,015	54,583	52,755	29,666	723,568

# APPENDIX B.

LIST OF NEW MASONRY WORKS EXECUTED IN 1903 AND THEIR COST, EXCLUSIVE OF SPECIAL WORKS.

NAME OF WORK	Cost	Total per Province,	Total per Circle.
4TH CIRCLE. FAYUM PROVINCE.	L.R.	fo.E.	LE.
Abu Gandir and Serb Inspection houses	200 28	228	
Walidiya syphon	1,162	1.162	1,390
Kena Province.  Saliba El Gabbana Regulator Teima culverts	300 153 50 50 20	582	
El Manmal sayala head Sayala hod Bimban culvert Selwa road bridge Nilometre at head of Ramadi Canal  ASYUT BARRAGE DIRECTORATE.	548 107 80 50	785	1,367
ASYUT PROVINCE.  Regulator Gist El Haraz	340 103	413	413
	Grand Tota	1	3,200

# APPENDIX C.

LIST OF MASONRY WORKS REPAIRED AND REMODELLED IN 1903 AND THEIR COST.

Name of Work.	Cont.	Total per Province.	Total per Circle.	Grand Total.
	I to Vin	L. H.	L.E.	L.E.
ATH CIRCLE.  ASYUT PROVINCE.  Petty repairs to Bridges	200 200 100 316 176 232	1,224		
MINIA PROVINCE.		1,221		
Repairs to Inspection houses	E4MS	1,049		
BENI SURF PROVINCE.				
Repairs to Koshesha escape (arrears)  Syphon on Muhit drain  Painting ironwork  Petty repairs to Bridges  Repairs to Mazurah Regulator (arrears)  pipe syphon under Magnuna Canal  Iron Syphon under Bahabshin Canal  Painting Kosheshah gates	2.545	2 ,713.0		
N P		1,631		
FAYUM PROVINCE.  Petty repairs to Bridges	200 150 146 128 100	1,501		
Carried forward			5,405	
, , , , , , , , , , , , , , , , , , , ,			17,7670	

LIST OF MASONRY WORKS REPAIRED AND REMODELLED IN 1903 AND THEIR COST (contined).

NAME OF WORK	Cost	Total per Province.	Total  Int Circle.	Grand Total.
	1	LeRe	L.E.	L.E.
Brought forward			5,405	
5TH CIRCLE.				
KENA PROVINCE.				
Repairs to Maalla Rest house  Nag Hamadi house Hisha Escape  W. Branch Raman Canal Head Regulator  Escapes Hods El Sahara E. and W.  Repairs to El Namasa Regulator El Dimigrat Regulator Isna Rest house Qus Rest house and store Hod El Rakaik culvert El Massab culvert El Mussalha culvert El Gobalan escape El Tadiliyah Canal Head Miscellaneous Petty Repairs	34 36 100 20 35 36 17 32 20 12 11 12 23 15 154	537		
ASWAN PROVINCE.		,,,,		
Miscellaneous petty repairs	43			
		43	25000	
			600	
GIRGA DIRECTORATE.			6,005	
GIRGA PROVINCE.				
Repairs to Awlad Yehya Escape  " Isawiyah syphon " Samama West regulator " Bayadi Syphon " Enebis Escape " Araba Idfa Escape " Sahil Awlad Khalaf Culvert " Un Dumah E. Escape " W. Escape " Falihat Regulator.  Miscellaneous Petry Ropairs	218 131 86 22 27 22 20 25 50 6,357 54	7,012		
Carried forward			13,017	

LIST OF MASONRY WORKS REPAIRED AND REMODELLED IN 1903 AND THEIR COST (continued).

NAME OF WORK	Crmt.	Total per Province.	Total per Circle.	Grand Total,
Brought jorward	L.E.	L.E.	13,017	I.E.
ASYUT 2ND SECTION.  Badari Salibah Regulator Madmar Escape Aqadma Regulator Abu Tig Escape Tisaa Regulator. Sultani Culvert. Shuth Escape Selim Escape Miscellaneous Petty Repairs  ASYUT BARRAGE DIRECTORATE.  Repairs to Abnub Bridges Asyut Bridges Muufalut Bridges Deirut Bridges Miscellaneous Repairs	15 21 91 123 74 111 12 26 27 399 150 200 200 115	500	.500	
		1,064	1,004	14,581

# APPENDIX D.

EABTHWORK IN MAINTENANCE CHARGED TO REGULAR AND CORVÉE BUDGERS, L'PPER EGYPT, 1903.

Cost.	14,85	6,876 17,093 8,729	18,045		26,658	36,072	1	0,585	23,0633		7,22,23 X,914	16,237	123,417
Fr A fa	O.M.	125,282	B,865,990		2,162,376	2,883,966		530,213	2,071,749		638,388 100,000	738,388	9,560,093
Require to nageleultu-	G.M.	1111	1		11	1		1 1			13	1	
New connis	C.M.	1111			11	ı		1	-		64,708	64,708	64.708
Sadds in canala,	C.M.	1997	19.976		66,455	107,514	3	11.191	11,731		11	1	131,541
Closing or units,	C.M.	07.678 F0678	18,930		13,192	13,440		0, 193	25,505		56,055	243,415.5	143,930
Cheirman of s. f. drades and new draine.	C.M.	18,268 18,168 18,188 18,188	267,330		11	1		1 1			11	1	267,330
thurmer of cantle.	C.M.	211,365 130,221 515,636 524,956	1,685,172		3,8346	B.S.E.		11	1		100,000	100,000	1,789,068
rlearnnee of Nill causis and dusins.	e.al.	309,004	560,556		1,971,215	2,641,447	5	308,311	1,462,559		181 × 187	268,129	1,935,691
Repuirs to imples.	C.M.	180,191 528,451 491,685 91,396	1,291,726		107,618 7,051	114.669	2 2 2 2 2 2 2 2 2	212,400	571.034		240,496	249,496	2,227,825
PROVINCE.	Fru Cherr.	Fuyum Beni Suef Alinin Asyut	Total, 4th Circle	JIH CHELE.	Kenn Aswan	Total, 5th Circle	GREA DERCTORATE,	Asyut 2nd Section	Total, Girga Directorate	ASYLT BARRAGE DRECE,	Asymt Dredging Ibrahimiyah Canal	Total Asyut Barrage Direct,	Grand Total

# APPENDIX E.

STATEMENT SHOWING THE NEW BANKS AND CHANNELS MADE IN 1903, EXCLUSIVE OF "SPECIAL WORKS."

			=====
NAME OF WORK.	Length in kilometres.	Quantity of earthwork.	Total quantity.
4TH CIRCLE.	20015	C.M.	U.M.
Diversion of Nile banks  Extension Sheikh Temai canal	2.014 1.500 1.481	38,676 12,969 3,780	55,425
FAYUM PROVINCE.			
New branches Bahr El Maqatla	16 · 961 3 · 096 1 · 625	26,694 10,956 2,880	
Extension channel El Azah  Bahr Arus remodelling	1 · 152 3 · 250	1.286 838 424	-
East Buhr Etsa	1 · 1 44 3 · 200 1 · 832 0 · 1 40	8,879 9,000 555	
Remodelling Bahr Abuxa	10	33.751 51,943	117,206
Total 4th Circle		_	202,631
GIRGA DIRECTORATE.			
GIRGA PROVINCE.			
Extension of Sayalet Nag Tammam E	1.610 1.000 0.984	4,060 7,874 10,318 15,662 9,227	
ASYUT 2ND SECTION.			47,141
Extension of masraf Hod El Duer	4*805	10:350	10,350
Total Girga Directorate	-	-	57,491
Carried forward	-		200,122

# STATEMENT SHOWING THE NEW BANKS AND CHANNELS MADE IN 1903, EXCLUSIVE OF "SPECIAL WORKS"—continued.

NAME OF WORK.	Length in kilometres.	Quantity of earthwork.	Total quantity.
		С.М.	O.M.
Brought forward	_	_	260,122
ASYUT BARRAGE DIRECTORATE  Diversion Salibah Beni Rafi	0.752	13,348 16,246 11,926	41,520 301,642

#### ABSTRACT.

CIRCLE	New Channels.	New Banks.	Expenditure.
4th Circle	Kilometres. 46°691 9°014	2.014 0.984 1.185	2,894 639 483
Total	55*705	4.183	4,016

# APPENDIX F.

GENERAL ABSTRACT OF EXPENDITURE ON "SPECIAL WORKS" CHARGED TO SPECIAL CAISSE CREDIT AND SPECIAL GRANT FROM ORDINARY BUDGET.

			E	XPENDITUR:	II.	
NAME OF PROJECT.	Name of Work.	Ordinary Budget.	Cuisse Credit.	Total per Work.	Total per Project.	Total per Circle.
W-17 0 0 11 1	STH CIRCLE.	L.E.	L.E.	I.E.	1	LE.
West Hafiz Gaushiyuh	Walidiyah synhon under Ibmhi-		tilli	RS.	6.5	
Walldiyah Syphon.	miyah	-	- 6600	(21)	(Site)	
Asynt Converted Basins,	Pitching Masonry Earthwork Iron work	-42 -611	619 1,272 1,255 —	619 1,314 1,255 611	3,799	
Fayum Remodelling Projects.	Earthwork in canals  Earthwork in canals  Masoury in la canals  Revenment in canals  Denaireation stones  Ironwork in draius  Masoury in draius  Ironwork in draius  Ironwork in draius	1,312	2,526 1,652 35,373 13,650 803 40 7,000 5,080	2,526 1,652 35,873 13,650 803 40 1,313 7,080 3,080 445	67,882	79.346
Railway diversion   Hod Hannad.	5TH CIRCLE.	_	3,650	8.630	3,630	22,040
Aswan district canals.	Earthwark	-	370	370	370	- 4,888
Asvut Busins	PROJECTS CIRCLE.					
Conversion.	Cost of land		3, \$ cm :	3,100	B. FORA	
Southern Minin Basins Conversion,	Strengthening canal banks Masonry works Irrigation outlets Stone for Bahr Yusuf Cost of land Working canals	7%	11,730 7,652 334 1,435 37,029	\$1,730 5,447 334 1,435 37,025 1,027	(43,6882	
	Ourried forward		-	-	63,102	76,946

GENERAL ABSTRACT OF EXPENDITURE ON "SPECIAL WORKS" CHARGED TO SPECIAL CAISSE CREDIT AND SPECIAL GRANT FROM ORDINARY BUDGET (continued.)

		Expenditure.				
NAME OF PROJECT	NAME OF WORK.	Ordinary Budget,	Caisse Credit,	Total per Work.	Total per Project.	Total per Circle.
		I.E.	L.E.	L.E.	L.E.	L.E.
	Brought forward	-	-	-	63,102	76,346
Northern Minist   Basins Conversion.	Conversion works	1,900 970	151,300	153,109 970	154.079	
West Girch Busins Conversion.	Printing west Gizeh maps	250 —	4,490	250 4.490	8.780	
Widening Brahiminh Causi.	Widening Deirut to Minin  Minis to Matay  Matay to Mayana  Revetment Minis Etsa  Land-Minia-Matay		33,999 40,485 17,767 2,151 6,907	33,999 40,485 17,762 2,151 6,907	101,510	
Remodelling Muhit Drain.	Remodeling Etsa to Salibah Kom Saaydah and Absug drain Land Sabakhah-Etsa	9455	50,784 1,601	51.149 1,601	52,750	
Etsa Pumping Station.	Buildings Chimneys Regulator on Etsa drain Fall on Etsa drain Inspection House	560 620 485 —	19,521 2,659 1,652	30,051 020 3,144 1,652 461	D. N. N. No.	
Temporary establishment and petty expenses.	Establishment and petty expenses Portable wooden houses	(886)	15,489	15,489 866	13,955	418.034 °
	Grand Total	361,078	_	-	-	401,380

Includes L.E. 60,712 advanced by Finance Department to be recovered from Caisse Grant of 1904.

# APPENDIX G.

LIST OF MASONRY WORKS EXECUTED UNDER "SPECIAL WORKS" GIVEN IN APPENDIX F.

			Cost.	
NAME OF PROJECT.	NAME OF WORK.	Per Work,	Total per Project,	Total per Circle
	4TH CIRCLE.	L. E.	Par Ser	Lo. R.
Walidiyah Syphon,	Completing Walidiyah Syphon under Ibrahi- miyah Causl	600	isui)	
Concession of Asyut Basins,	Pitching Room and Store at Baragil Three culverts and remodelling Ashmunin Regulator Escape tail Canal Arus Three road bridges on canals Iron and wood work	619 42 659 100 513 611	2,544	
Fayum Remodelling.	Casale:  Demarcation of land on Canal A. Wahbi — 3rd reach  22 Masonry works on Bahr Seilah  23 Masonry works on Bahr Serb  Revetment on Seilah system  Iron work  Drains: Falls below Khazzan Tamiyah  Masonry works on Seila system  Iron work	40 6,070 7,580 803 1,313 660 4,420 413	21,331	24,470
Southern Minia Rasins Conversion.	PROJECTS CIRCLES.  22 Regulators 13 Head Shuices 12 Escapes 8 Road Bridges 7 Syphons	8.212		29,310
Northern Minta Busine Conversion	26 Regulators 78 Head Sluices 115 Read Bridges 53 Orainage inlets 4 Fallas 17 Syphons	SOLONE	4,212	
Widening the Ibrahimiyah,	8 Head Stuices	1,095	60,037 1,095	
Remodelling Muhit drain,	2 Regulators 1 Escape 20 Road Bridges 2 Railway Bridges	17,805	17,808	77,149
	Grand Total	-	-	101,624

#### APPENDIX H.

Lest of New and Remodelled Banks and Channels executed under "Special Works" given in Appendix F.

		Length	Quantity	Cos	ST.
NAME OF PROJECT.	NAME OF WORK.	iu kilometres.	of earthwork.	Per work.	Total per Project
	4th CIRCLE		C. M.	L. K.	L. E.
Asyut Basins Conversion,	Banks	3,349) 3,505 13,237	18,235 15,428 59,278	1,235	1,25
	2nd Reach A. Wahti 2nd Reach A. Wahti Brd	29, 924 17,500 30,000	1,142,298 586,226 486,653	13,9662 8,312 7,366	
	branches	18,034	261,888	3,770	
	Bemodelling Bahr Seila and Roda	79,478	479,169	7,000	42,37
	Total 4th Circle	199,488	2,98F,615	43,629	43,62
	PROJECTS CIRCLE				
Southern Minia   Busins Conversion.	New channels	67,250 —	484,640 480,544	6,478	14,78
Northern Minia. Basins Conversion.	Canals	310,500 230,500	5,154.260 595,718	88,795 11.021	99,87
Widening the Ibrahimiyah.	Deirut to Minia	Ξ	1,115,074 1,004,900 1,010,593	22,121 39,699 16,895	78,71
Remodelling Mobit drain.	Etsa to Salibah Kom Saaydah and Abang drain	_	2,018,013	36,318	34,3
Etan Pumping Stations.	Dollvery channels	-	27,980	504	(in
	Total Projects Circle		12,256,728	230,140	230,1
	5th CIRCLE				
Railway diversion (	Straightsning bank	0,604	-	3,630	3,0
Aswan Districts Canala	Small channels			370	3
	Total 5th Circle		-	4,cmm)	1,0
	Grand Total			_	277.7

#### APPENDIX K.

#### REVETMENT OF BASIN BANKS WITH STONE.

	L	NOTH REVETT	ED.	EXPENDIT	CRE DURING	THE YEAR.
PROVINCE.	Previously reported.	Added during 1903,	Total to date.	New Revolument	Repairs.	Total Expenditure.
	M.	M.	M.	LE.	L.R.	I.E.
4TH CIRCLE.						
Beni Suef	40,320	_	40,329		~	-
Minia	89,069	1.003	90,072	1,395	337	1,732
Asyut	59.236	-	59,236	-	-	-
Total	188,634	1.003	189,637	1,395	337	1,732
GIRGA DIRECTORATE.						
Girga	47,253	2.397	49,650	1,219	170	1,389
Asyut 2nd Section	50,203	3.096	53,299	1,632	169	1,801
Total	97.456	5.493	102.949	2,851	339	3,190
Grand Total	286,090	6.496	292.586	4,246	676	4,922

## APPENDIX M.

STATEMENT SHOWING THE AREA UNDER DIFFERENT CROPS IN UPPER EDITY, INCLUDING GOVERNMENT AND WAKES LAND AND LAND OF THE DAIRA SANIER AND DOMAINS, FROM SEPTEMBER 1903 TO AUGUST 1904.

	1		9	70	11,3		Em and	20	=	£
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	tal man faleT	P K.L.	20 20 20 20 20 20 20 20 20 20 20 20 20 2	5163tri	100131	1030-13	380em3	012601	athol	48000
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1	Shaint Maise.	1	<u>#</u>		-	2	1 0	91	7	-
Nun	lata frails.?	1134	13.5 MID 2	1348838	GARDU	216 (419)	D+845	52712	03514	401773
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	entil remune	1 1.12	1	-03	1	1	1	1	1	c
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WE	Attroff	10 EEE 17	63710	119443	Panne	в 13сная	изва	200	SBBH	51 12 12 12 12 12 12 12 12 12 12 12 12 12
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	H		4	-		·	*		0	0 0
	NAME OF PROVINCE.		Beatl Stuff.	:	:	0	:	0 n	:	Total .
	4		Detil	Payreen	Minia	Aryut	Girga	Kons	Aswan	ē

#### APPENDIX S.

TABLE I.—Statement showing the quantity of Sugar-cane chushed in the Daira Sanieh Factories in Middle and Upper Egypt in Season 1903-1904 and the amount of No. 1 Sugar produced.

NAME OF FACTORY.	Cane crushed in kantara.	Outturn of No. 1 Sugar in kantars.
MIDDLE EGYPT.		
Biba , , ,	1,495,260	129,016
Maghagha,	1,974,136	183,002
finia	2,372,916 —	211,957 —
Total, Middle Egypt	5,842,312	523,975
UPPER EGYPT.		
GILER EGILI.		
Pabaiyah	_	_
Iata'analı	994,307	104,281
Total, Upper Egypt	994,307	104,281
Grand Total	6,836,619	628,256

#### APPENDIX S-continued.

TABLE II.—Sugar-cane crushed and Sugar out-turned by the Dahra Sanieh Factories during the last twenty-five years.

Factory econon.	From erop of.	Quantity of cane crushed in kantars.	Total sugar produced in kenters.	Nature of summer level proceding factory ecason.	REMARKS.
1880 1881 1882	1879 1880 1881	8,402,833 2,365,642 7,336,192	605,623 182,096 603,225		and 3.
1883 1884 1885	1882 1883 1884	4,880,094 8,445,247 9,918,201	422,622 667,451 854,884	Unfavourable. Favourable. Very favourable.	Nos. 1. 2
1886 1887 1888 1889	1885 1886 1887 1888	11,258,057 10,986,224 10,411,640 8,382,837	973,500 934,376 951,352	Fair. Favourable. Favourable. Fair.	
1890 1891 1892	1889 1890 1891	7,602,302 11,190,799 12,522,918	790,197 695,870 1,149,893 1,329,627	Very favourable. Very low. Low but early rise.	e three q
1893 1894 1895	1892 1893 1894	12,755,107 14,253,813 14,601,832	1,207,164 1,427,608 1,385,345	Low and late rise. Very favourable. Favourable.	The total sugar produced includes the three qualities
1896 1897 1898	1895 1896 1897	15,217,050 13,253,433 12,369,140	1,564,972 1,882,979 1,176,067	Very favourable. Very favourable. Very favourable.	oduced ii
1899 1900 1901	1898 1899 1900	11,636,689 12,680,860 9,680,482	1,173,871 1,340,983 1,057,902	Very favourable. Very low but early rise.	a and a
1902 1903	1901 1902	9,649,009 9,144,560	1,081,967 944,643	Very low rise early, but feeble. Very low with late and feeble rise.	The total
1904	1903	-	_	_	

#### APPENDIX S-continued.

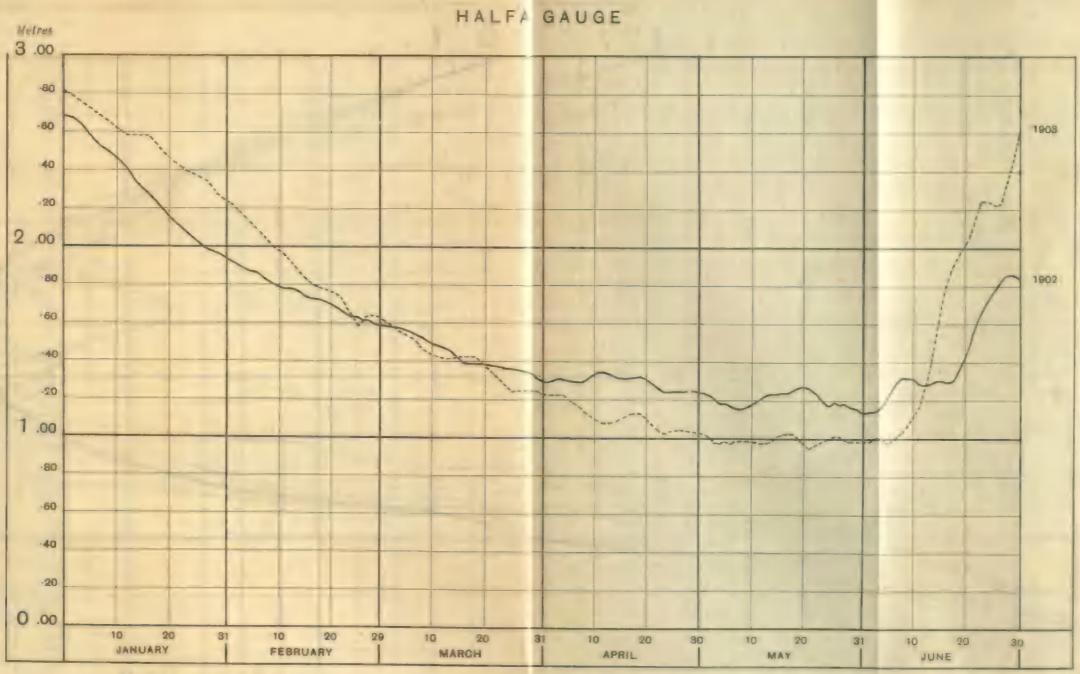
TABLE III.—Sugar-cane crushed and Sugar outturned in Sultan Pasha's Factory at Damaris during the last twenty-one years.

Factory Senson.	From crop of	Quantity of case crushed in kantars.	Total sugar produced in kantars.	HEMARKS.
1884	1883	258,855	23,199	91
1885	1884	258,405	24,720	
1886	1885	250,426	23,705	N. 0.99
1887	1886	272,984	23,903	Z
1888	1887	274,549	23,636	- 6
1889	1888	276,505	24,648	The total sugar produced includes the threequalities and 3.
1890	1889	266,218	23,783	edr
1891	1890	228,421	31,609	lire
1892	1891	382,791	36,161	ne t
1893	1892	442,187	37,275	<b>\$</b>
1894	1893	471,076	40,253	reludes and 3.
1895	1894	545,274	47,429	nel nel
1896	1895	587,462	59,543	-=
1897	1896	451,390	40,566	nce
1898	1897	479,822	48,761	rod
1899	1898	466,027	46,732	
1900	1899	524,466	54,966	na:
1901	1900	410,465	44,700	SES SES
1902	1901	565,931	52,102	ofa
1903	1902			2
1904	1903	384,828	37,099	E

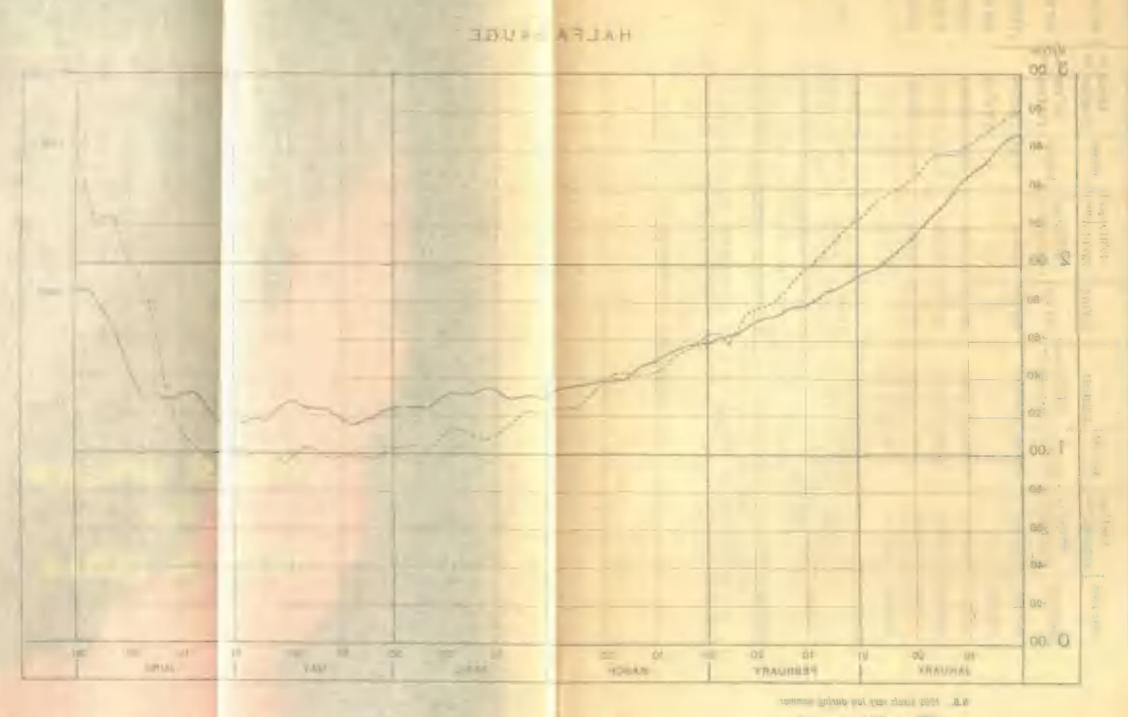
# APPENDIX S-concluded.

TARLE IV.-STATEMENT SHOWING THE QUANTITY OF SUGAR-CANE CRUSHED IN THE FACTORIES OF THE "Société Générale des Suchemes de la Haute-Egypte" and the quantity of No. 1 Sugar PRODUCED DUBLING THE PAST SEVEN YEARS.

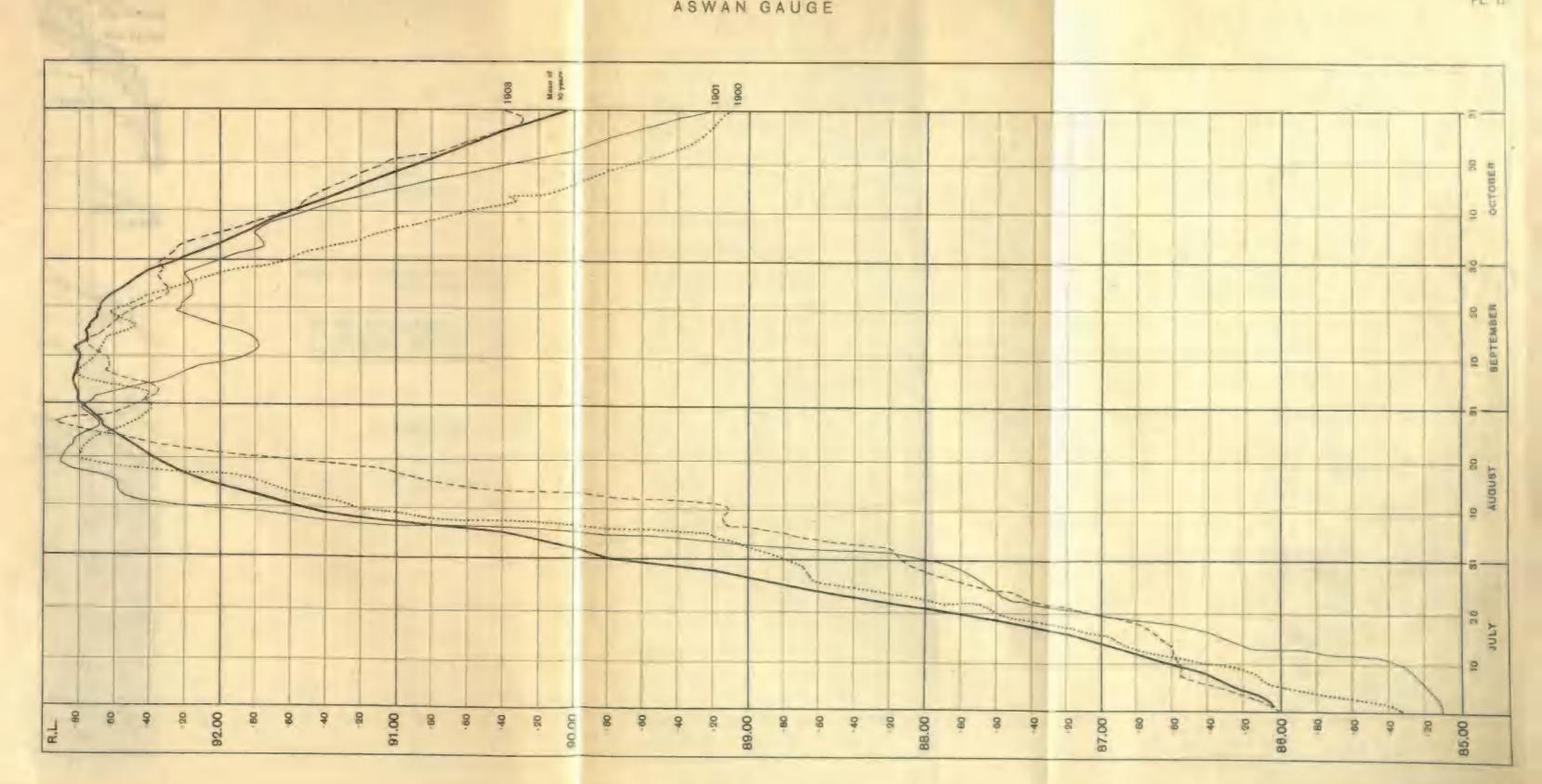
			FACTURIES	1159.				
	Nage Hamadi.	mudf.	Makh-Fadi.	rdl.	Hawmilyali.	yelt.	TOTAL.	
SLABON.	Chano cirindani in kantara.	of No. 1 Sunar in kentare.	Cause trushed to kantore.	Outenti of No. 1 Sugar to kantura.	Cabo erudusi in kantura	Outturn of No. 1 Bearn In kintern.	Cane cendrel In Raniurs.	Outturn of No. 1 Sugar to kantare.
1896-1897	641,438	53°XXX	68,888 1,822,204	191,109	191,109 1,333,320	135,554	135,554 3,749,962	395,551
1897-1898	1,661,418	108,870	108,870 2,782,670	238,574	6.5-4, 8.0×	56,990	56,990 5,098,896	409,434
1898-1899	1,776,825	173,263	3,158,415	3401.949	344,949 1,315,080	125,790	6,250,320	604,002
1839-1940 1,618,341	1,618,341	168,252	168,252 3,169,252	301,191	301,191 1,191,278	105,641	105,641 5,978,871	575,409
1900-1901	-	1	1	1	1	ı	6,908,772	682,587
1901-1902	3,231,460	265,600	3,505,617	283,164	916,471	94,067	94,067 7,653,548	• 642,813
1902-1903	3,233,284 tunn 83,434 ked	315,977	3,487,123, case 182,283) [66]	371,570	923,692) Cam 91,559) Red	108,038	7,644,099) case 360,688) loc	195,585
1103-1104	4,603,863) cas 4,517) ser	481,533	7,6(m)9,5	274,016	528,019) Gans	284.45	7,822,829 (Sans	821,031

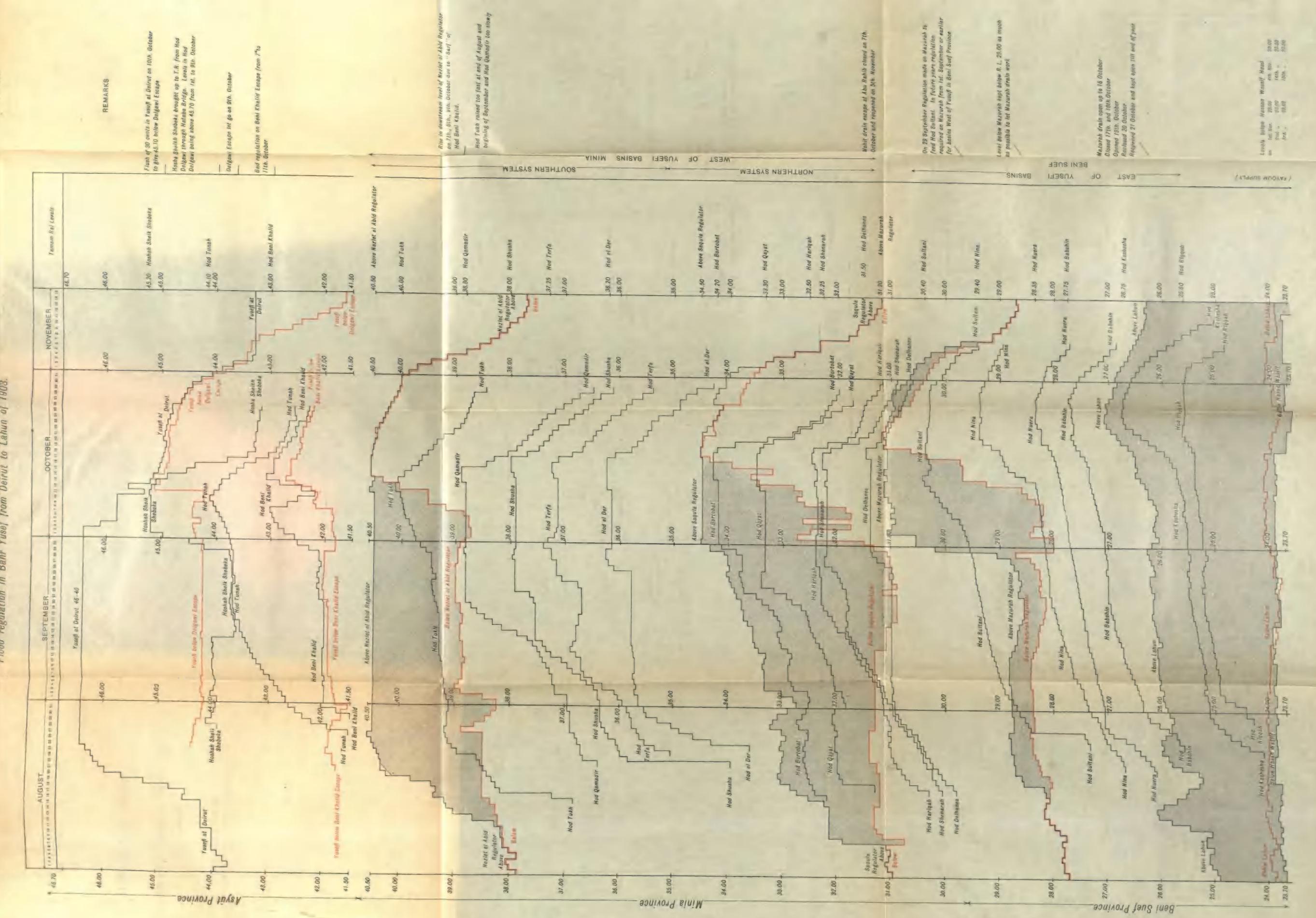


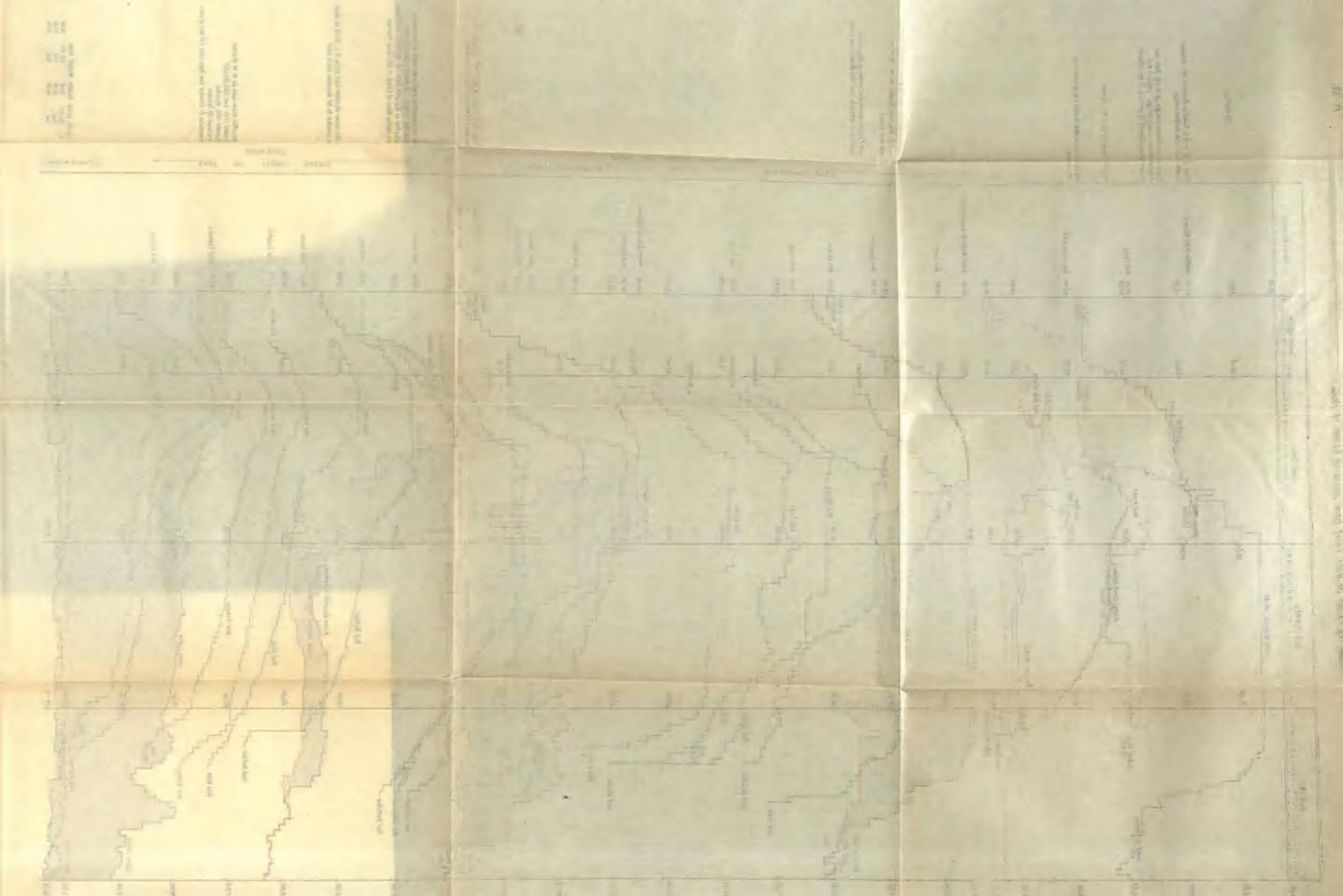
N.S. 1902 levels very low during aummer 1903 - still lower - 2



1000 Sill toware so







#### ADMINISTRATION REPORT

OF THE

### IRRIGATION DEPARTMENT IN LOWER EGYPT For 1903

BY

#### K. E. VERSCHOYLE,

INSPECTOR GENERAL OF IRRIGATION IN LOWER EGYPT.



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0														100	192
D . 4 .					444									.44	120
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Nile gauges								718							136
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, <u></u>															
		CHAI	TE	R 11	11	HAI	NAG	E.							
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Mex pumping stations				***								200	100		140
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	***		-4.												
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Draitings works	-41				***			- + + +						110	1152
New channels irrigation a							01.			-				101	6.0.4
Sundry credits				111			4 1						111		
Agricultural roads											1111				
Forry bridges								24.			444				156
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Flood productive works									4 -					160
General maintenamer						* * *				-	5.0.4	-	E (4) 1	101
Maintenance of canals and drain	1		111											162
Dredging	100									1.0		111		104
				ndo.										
CHAP	TER V	I	WAB	Tt	13111	TAL	EST.	ATH						
Capital expenditure		797	***	191	0 1-9	***	• • •	***	999		***			164
Revenue account		44.0	0.00	141	014	210	981	400	41.	100		10	P# 0	165
Crops				* 1		-				***		01.0	100	146
Knasnasin pumping station				***						- 4 -				100
Estimate for 1904	101 010		110	***	2.4.1	***	***	100		+ 1 0	***	***	***	147
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#### ADMINISTRATION REPORT OF THE IRRIGATION DEPARTMENT IN LOWER EGYPT FOR 1903.

#### CHAPTER I.

#### WINTER, SPRING AND SUMMER IRRIGATION.

#### RIVER LEVELS.

As the Aswan Reservoir began to withdraw water from the river on the 20th October 1902, the levels on the Aswan gauge after that date cannot be compared with those of previous years. In future the Wady Halfa gauge will be the one used when comparing different years as regards the supply in the river.

The level on the Wady Halfa gauge on the 1st of January 1903 was 2.80, which was 4 centimetres higher than the level on the same date in 1901, 12 centimetres higher than the level on the 1st January 1902, and 86 centimetres higher than the level recorded on the 1st January 1900, the year of minimum recorded summer supply. The mean level for the 1st January on the Wady Halfa gauge for the past 12 years is 3.20, so that judging by this gauge the year did not open with very bright prospects as regards summer supply; in fact the only years on record which started with a lower level at Halfa were 1900, 1901, 1902. The level at Khartoum was, however, slightly more encouraging, being 26 centimetres higher than the levels for the same date in 1900 and 1902, though 10 centimetres below that of 1901.

The level at Khartoum fell steadily up to the 17th May, on which date the gauge reading was 10 centimetres lower than on the same date in the minimum year of 1900.

The rise commenced in a very satisfactory manner, so that by the 25th May the levels of the three previous years were surpassed at Khartoum, and the level of 1899, a year of good summer supply, was passed on the 29th May. The rise continued satisfactory up to the 18th June when a check, ending in a slight fall, occurred. By the end of May it was evident that the supply above the Delta Barrages might, irrespective of the reservoir supply, be expected to improve by the end

of June, and, with the aid of the reservoir supply at an early date in June, ereate a very happy state of affairs as compared with any previous year.

SADDS IN THE ROSETTA AND DAMIETTA BRANCHES OF THE NILE.

In anticipation of the assistance from the Aswan Reservoir, it was decided not to make the Faraskour Sadd in the Damietta Branch which had been made in 1900, 1901 and 1902.

In order to maintain the level above the sadd in 1902, it was found necessary to pass water into the river at Mansurah during May and the first half of June, and again from 12th July, and also to pass a small discharge through the Delta Barrage. The gross cube so passed into the river from April to July, was, as near as I can estimate on the data available, about 86,000,000 cubic metres, meanwhile, the 68 river pumps north of Mansurah were raising water at the rate of 1,356,000 cubic metres per day, i.e., they raised a total cube of 165,000,000 cubic metres between the beginning of April and end of July. Deducting the amount passed into the river at the Delta Barrage and Mansurah, which could otherwise have been utilized in the canals, we are left with 79,000,000 cubic metres as the amount of water derived from the pool above the sadd from the date of its closure up to the end of July. None of this cube would have been available without the sadd, as only the cube raised by the pumps north of Mansurah has been taken into account.

This cube of 79 millions would have sufficed to give 6 waterings to an area of 33,000 feddans of ordinary crops. The cost of the sadd was L.E. 5,000 which comes to P.T. 15 per feddan of irrigated area.

It appears from the above that, if the figures for the cube passed into the Damietta Branch are approximatively correct, there is a good deal to be said in favour of constructing this sadd, especially if it be decided not to feed the Rayyah Abbas and Mansuria Canals from above Zifta Barrage in the summer.

#### MEHALLET EL AMIR SADD.

The Mehallet El Amir Sadd on the Damietta Branch was made for the fourth year in succession at a cost of L.E. 7,871. The sadd was commenced on 28th January and finally closed on the 20th May. A breach, which occurred in the portion crossing the deep channel on the east bank on 9th April, delayed the closure considerably.

The sadd was made with a crest level of 3.25 to hold up water to R.L. 2.50.

The volume of water withdrawn from the pool above the sadd is estimated as follows:—

							Cubic metres.
By the 2nd Circle Canals		 					39,281,500
By the Rosetta Canal Behern	0.0.0	 			901		13,169,421
By Atl pumps		 		***			15,393,618
By private pumps		 	100	***			7,000,000
			marin.				74,844,039
			Taire	020	444	***	(3)13330000

The sadd was cut on the 21st July.

The cube of 74,844,039 cubic metres would suffice to give three waterings to an ordinary crop of 62,370 feddans between the 20th May and end of July. The cost of the sadd being L.E. 7,871 the cost of irrigation per feddan works out to P.T. 13. It is well worth spending L.E. 7,871 to assure the crops and taxes on an area of 62,370 feddans.

#### ATE PUMPING STATION.

It was only found necessary to work the Atf wheels for 22 days between the 6th May and 15th July. The expenditure on the station was as follows:—

	1
Establishment and maintenance charged to Regular Budget	450
Working pumps charged to Low Nile Credit	725
Contribution from Kom El Akhdar Estate towards working	1.00
of pumps	176
Total 1	.E. 1,351

#### WINTER AND SPRING ROTATIONS.

The supply during the winter was ample for all demands. A good deal of attention has latterly been paid to the important subject of regulation at all seasons, with the object of producing levels for limited periods sufficient for flow irrigation wherever that may be possible. This is a boon much appreciated by the cultivators as the saving thereby affected in cost of fuel and wear of cattle is very great. An adequate provision of regulators is of course the first requisite towards making the system general. Thanks to the funds granted by the Caisse de la Dette for irrigation improvements, a good many regulators have been built during the past few years. This system of scientific and systematic regulation is most advanced in the 2nd Circle in which tables indicating the periods of high and low supply and the levels above and below regulators to be worked to, have been drawn up.

During the winter and spring 4 days of high, followed by 12 to 16 days, according to the time of year, of low supply is given. The Inspector of Irrigation 2nd Circle notes that it was found possible, during the past year, to continue this system up to the middle of April after which the general working of lift machines made it impossible to keep up levels. A month of unrestricted irrigation with low levels then followed till replaced by the usual summer rotations.

#### SUPPLY FROM ASWAN RESERVOIR.

It had been originally intended to indent on Aswan Reservoir for Lower Egypt as follows:—

									Cubic metres per day,
From	1st	May	to	20th May	 ***		400		2,000,000
9.0	21st	**	to	25th "	 	***		* * *	5,000,000
9-9	26th		to	9th June	 				7,000,000
0-1		June	to	27th "	 ***				10,000,000
99	20th	99	to	7th July	 	0.00			10,000,000

The early rise at Khartoum, however, rendered it possible to modify the programme so as to complete the emptying of the Reservoir at an earlier date, and the programme worked to was as follows:—

					Water drawn from Reservoir for Lower Egypt,
From 1st to 20th May	460	***	100	001	2,000,000 cubic metres per day
., 21st May to 25th May	= + +				7,000,000
" 26th May to 3rd June					9,000,000
4th June to 24th June					15,000,000

The rise began to reach Aswan on the 17th June.

#### SUPPLY REACHING DELTA BARRAGES.

The Delta Barrages were tightly closed from the 10th April. The supply reaching them continued to diminish up till the 1st of June when the canals upstream of the barrages were drawing an aggregate discharge of 31,780,000 cubic metres per day. By the 8th June the discharge had increased to 36,220,000 cubic metres per day, under the influence of the discharge let go from the Aswan Reservoir on the 21st May. From the 10th June, or 16 days subsequent to the date that a discharge of 9 millions per day began to be sent down from the

Reservoir for Lower Egypt, the discharge above the barrages began to increase rapidly and had reached 41,440,000 cubic metres per day by the 15th June. The level of 15:50, the maximum level to which water is held up on the barrages without allowing any water to pass through them, was reached on the 3rd of July. The same level was not reached in 1900 till the 2nd of August, in 1901 till the 22nd July, and in 1898 and 1899, before the new weirs below the barrages began to work, till the 12th and 31st August respectively. Had it not been for the Aswan Reservoir, no improvement in the supply for the Delta could have been expected before the 2nd or 3rd of July, and then it would have been much slower than was the case with the reservoir to draw on.

The construction of the Barrage weirs had the effect of reducing the time of tension, as regards supply in the Delta, by from three weeks to a month. The effect of the Aswan Reservoir, combined with an early and satisfactory rise in the river, during the summer of 1903, was to reduce the time of tension by about another month, so that the period of very short supply was reduced to 38 days or from 1st May to the 8th June. In 1898, 1899 and 1900 the periods of tension or very short supply were 92 days, 70 days and 113 days respectively.

This reduction in the length of the period of tension, which increased in intensity the longer it grew, has been an enormous relief to the Irrigation staff, which has no longer to devote its entire energy for three months of the year to the question of distribution of water, much to the benefit of general administration.

#### DISTRIBUTION OF SUPPLY.

Following the practice of the previous year the discharge reaching the Delta Barrages was distributed as follows:—

> 1st Circle 43 °/<sub>0</sub> 2nd Circle 34 °/<sub>0</sub> 3rd Circle 23 °/<sub>0</sub>

The following table shows a few of the weekly discharges observed, and compares them with the correct discharges worked out in accordance with the above basis of distribution:—

	1st C	BCLE	2511 (	IBCLE	BIID C	Cinci.		
DATE	Mensured Discharge.	Correct Discharge	Mensured Discharge	Correct Discharge.	Mensured Discharge.	Correct Discharge,		
15th May 15th May 1st June 15th June	17,611,875 15,876,302 13,444,997 14,294,256 17,339,002 19,959,663	16,249,700 13,824,500 13,669,730 17,823,500	13,399,600 12,012,944 10,376,225 15,614,986	12,848,600 10,931,000 10,808,620 14,093,000	8,512,931 6,695,723 7,119,074 8,494,519	9,165,500 8,691,700 7,394,500 7,311,700 9,533,500 10,421,114		

The table shows that the 2nd Circle came off somewhat the best at the expense of the 3rd Circle. This was due to the fact that the discharges of the Rayah Menufia gave steadily higher results for the same gauge readings than the discharge curve based on the previous years series of observed discharges.

#### SHARAKI DECREE.

The decree prohibiting the irrigation of fallow land until a date to be notified was issued on the 19th May 1903 to take effect from the 26th May 1903. The prohibition was removed on the 1st July when the level upstream of the Delta Barrage had almost reached 15:50.

#### SUMMER ROTATIONS.

Summer rotations commenced on the 15th May. They might with advantage have been commenced a fortnight earlier, as there was a considerable shortness of supply in some localities during this period.

The first table of rotations allowed for 6 days watering and 12 days stoppage for ordinary crops. For canals and sections of canals serving rice districts the rotation programme of the 1st Circle allowed for 4 days watering followed by 6 days stoppage, and those of the 2nd and 3rd Circles for 4 days watering followed by 5 days stoppage. The reason of the difference is that experience has shown that in the tangled system of long channels in the rice districts of Sharkia and Dakahlia it is impossible to get the rotations to work satisfactorily without the introduction of a day of general stoppage following the working turn of any section, so as to allow of the next section filling up throughout its length before the withdrawal of water commences. A notification was published in the "Official Journal" of 23rd March indicating the canals and sections of canals for which the rotation

programmes would be framed to allow of rice cultivation; a copy of this notification will be found in appendix D. The channels and sections of channels included in the notification practically allowed of rice cultivation over the whole area where it is ordinarily practised.

In appendix D will be found an interesting plan of the 1st Circle showing how the area was divided off into blocks for the purposes of rotations. The programme commenced by the stoppage of sections A, B, D, while C and E worked, after which came the turn of A and D and so on.

It was intended to apply the above programme for two complete rounds, i.e., from the 15th May to 19th June. It was, however, soon apparent that a programme allowing one watering in 18 days was too liberal. Taking the area given by the Ministry of Finance for the summer crop of 1902, and counting each acre under rice as equivalent to two acres under ordinary crop, we arrive at an area of ordinary crop of 1,446,000 feddans. Now on page 169 of last year's report, Sir Hanbury Brown showed that the amount of water required at the head of the Delta to give one watering to a feddan of ordinary summer crop was 555 cubic metres. If we accept the reasonable figure, given in "Egyptian Irrigation" (Willeocks), of 350 cubic metres as the actual amount of water required to give a watering to a feddan of summer crop, it follows that in the Delta 64 "/, of the head discharge on the average, is actually delivered on to the land. Compared with the results obtained in America and India, this is a very high percentage of which the apparent explanation is to be found in the small loss due to absorption, owing to a retentive soil, and probably still more to the efficient manner in which the fine Nile deposit puddles the irrigation channels throughout their length.

Now if each feddan requires 555 cubic metres and it be desired to give one watering in 18 days, the daily discharge required at the head of the Delta per feddan of ordinary crop becomes 555/18=30°S cubic metres. The discharge then required in the river at the head of the Delta to have admitted of an 18-day rotation in 1902 would have been 1,446,000 × 30°S=44,536,800 cubic metres, and to have justified the adoption of an 18-day rotation in 1903; at least this amount of water should have been in sight during May and June. Now the discharge available on the 15th April, allowing for 2,500,000 cubic metres in the river below the Barrage, was only 41,448,000 and it was pretty certain to diminish till the 1st week in June, even with the aid of the reservoir water. Hence the decision to draw up the rotation programmes so as to allow of one watering in

18 days cannot be regarded as a prudent one and the results obtained indicate the necessity of proceeding with greater caution in the future.

On the 15th May the available supply had fallen to 36,500,000 c.m. per day and by the end of the month to 34,300,000 c.m. per day. Before the latter date it had become evident that an 18-day rotation was not workable. The crop returns since received show that we were dealing with an ordinary crop of 1,539,000 feddans instead of 1,446,000 feddans, the figure used in the above calculations, which did not

improve matters.

Under the circumstances it was decided, on the completion of the 1st round, to stiffen the rotation by introducing 2 days of general stoppage between the 6-day periods of working which makes a rotation period of 24 days. In the rice districts of the 3rd Circle an extra day was added to the time of stoppage, making a rotation period of 10 days the same as that adopted by the 1st Circle in the original programme. The rotation periods for rice canals remained unaltered in the 1st and 2nd Circles. These programmes which, calculating as before, only required a river discharge of 35,397,000 c.m. was immediately effective. These days of general stoppage afford a means of compensating portions of sections which fail to get their full turn, and are most useful in preventing the collapse of the programme when dealing with a barely sufficient supply. As the supply increases and a little more water than required for one section becomes available, they can be omitted.

As noted above the supply began to increase rapidly from the 8th June, the discharge available on the 15th June being 44,900,000 c.m. and on the 23rd June 48,800,000 c.m. It was, therefore, found possible to gradually replace the 24 days rotation by others of much less severity. It appears that, had a start been made with two rounds of a 24-day rotation starting in the 1st of May, the conditions of supply would have been satisfied and the programme would have worked smoothly. As explained at the beginning of this chapter, the early summer supply was a very poor one, and in normal years, under existing conditions a 21-day rotation will probably be found to work satisfactorily.

The following table shows the nature of the rotations actually enforced, and the time each lasted:—

SUMMER ROTATIONS LOWER EGYPT 1903.

			N.	ATURE OF	Itotatio	N.		
			anals irrig ry summer		On continury	annls irrigating summer crops, etc.		
Circle.	Period of enforcement.	Number of days working,	Number of days	Frequency of waterings.	Number of days	Number of days	Possible fruguency of water	
1st " 2nd " 3rd "	15th May to 1st June 2nd June to 25th June 26th June to 21st July 15th May to 1st June 2nd June to 25th June 26th June to 2nd July 15th May to 1st June 2nd June to 25th June 26th June to 5th July	6 6 6 6 6 6 7 10	12 18 3 12 18 12 12 16 8	18 24 18 18 24 18 18 24 18	4 - 4	5 5	10 = 9 = 9 = 9	

Rotations were removed on the following dates:-

In the 1st Circle... On 4th July in Kalioubia Province and on 21st July in Sharkia and Dakahlia Provinces.

In the 2nd Circle... On the 3rd July. In the 3rd Circle... On the 5th July.

Results showed that it would have been better to maintain a mild rotation for another three weeks in the 2nd and 3rd Circles, as with the removal of the Sharaki Decree on the 1st July the demand, as usual, went up with a bound and notwithstanding the fact that the aggregate discharge of the canals on the 8th July had reached 71,000,000 c.m. per day, difficulties were experienced in getting water to the tail reaches well into July, and free flow levels were late in coming to sections of canals in which with a mild rotation they could easily have been induced at an earlier date. The moral is that rotations should be removed very gradually by gradually reducing the length of periods of stoppage. Mr. Dupuis, Inspector of the 2nd Circle, makes the following remarks in this connection:

"On the removal of restrictions all pumps and lifting machines worked their hardest irrigating Sharaki, with the result that canals running full flood supplies at their heads were pumped absolutely dry in their lower reaches, and hardly anywhere was the irrigation effected by free flow, many proprietors having to pay a heavy tax (generally P.T. 50 per feddan) to the pump-owners for the irrigation of their Sharaki lands. Had it been possible to stop all water lifting, it would have made practically no difference to the canal discharges, which would have irrigated the same area of land in the same time by free flow, and much useless expense would have been avoided. A mild rotation with overlapping turns would have met the case fairly well, as the smaller number of machines working would have been unable to keep down the canals, which would have risen and flowed on to the land through the outlets."

#### DUTY OF WATER.

The natural period on which to calculate the duty obtained from the available supply during the summer would appear to be that included between the dates of the commencement of summer rotations, and the removal of the Sharaki Decree. The imposition of rotations implies that supply no longer equals demand and that efforts are being made to extract the highest possible duty from the water. On the removal of the Sharaki Decree summer, flood, and winter irrigation becomes simultaneous and the calculation of a water duty becomes impossible. We thus arrive at the 46 days, included between the 15th May and the 30th June, as the period on which to work out the summer water duty for 1903.

The mean discharges of the main canals worked out as usual on the mean gauge readings for this period of 46 days were as follows:—

CANAL	Mean W.L.	Corresponding discharge.
	R.J.,	C.314.
Rayyah Behera	13.78	7,700,000
Rayuh Menufia	13.82	12,800,000
Rayyah Menufia Rayyah Tawfiki	13 • 44	10,200,000
Canal Ismailia	14.13	BUND CHID
Canal Sharkawia	14.15	2,000,000
Canal Basusia	14.10	950,000
Total representing mean dis	charge withdrawn b	y
anal above the Delta Barrage b	etween tota May an	

The areas under summer crops in 1903 as furnished by the Ministry of Finance are as follows:—

CIRCLE.	Summer Rice.	Cotton and Summer Crops other than rive.
	Feddans.	Feddans
1st Circle	56,893 26,872 41,843	534,095 491,724 261,098
Total	125,608	1,286,917

The supply of water available for irrigation during the selected period of 46 days is as follows:—

Total discharge of 6 canals  Lifted by River Pumps below the Barrages  Taken from Mehallet El Amir Pool	36,650,000 2,500,000 816,000
Deduct for Alexandria	39,966,000 145,000
Available for Irrigation	39,821,000

Assuming, as done in last year's report, that rice takes double the amount of water that other summer crops do, the general duty is arrived at as follows:—

$$\frac{\text{Total available sapply } 39.821,000}{125,608 \times 2 + 1,286,917} = \frac{39.821,000}{1,538,133} = 25.9 \text{ c.m.}$$

a feddan of rice would thus require 51.8 cubic metres per day, and a feddan of other summer crops 25.9 cubic metres per day. Both the Inspectors of the 1st and 3rd Circles agree in considering the area-furnished by the Ministry or Finance as considerably below the mark, especially as regards the area under summer rice. The Inspector of Irrigation, 1st Circle, estimates the area under rice in his Circle at 78,270 feddans, against 56,893 feddans given in the statement supplied by the Ministry of Finance. With such uncertainty as to the correct areas under crop, figures for water duty must be accepted with the utmost reserve. On all sides in the northern Delta freshly reclaimed land under crop is to be seen, which leads to the belief that there must be a steady increase in the cropped area.

The following are the calculations for the summer water duty worked out for each Circle separately:—

#### DUTY OF WATER-1ST CIRCLE.

The areas under crop were:—	
	Feddans.
Summer rice	56,893
Cotton and other summer grops	534,095

Doubling the rice area and adding the product to the area of other crops we get 647,881 feddams.

The mean summer discharges were:-

									Cubic metres per day.
Rayyah Tewfiki	8 0 0			***					10,200,000
Canal Ismailia			111						3,000,000
Canal Sharkawia	9.00	400	0 = 1	100	***				2,000,000
Canal Basusia	***		* * 4	100			404	004	950,000
River pumps			2 0 0	1 0 0	* 4 4	00-0	000	1 * *	500,000
						Total			16,650,000
Deduct for Port	Said	and	Snez				406		100,000
	Tota	al as	milabl	ខ នព	pply	***		200	16,550,000
				2 29 2		1111			

The general duty is, therefore,  $\frac{16,550,000}{647,881} = 25.5$  cubic metres.

#### DUTY OF WATER-2ND CIRCLE.

The areas under crop were;—  Summer rice	Feddana. 26,872 491,724
The available supply was:—	Cuble matres
Rayyah Menufia	1,500,000
Total discharge available	11000000
The general duty is, therefore, $\frac{14.966(100)}{26.872 \times 2 + 491.724}$	= 27°4 cubic metres.

#### DUTY OF WATER-3RD CIRCLE.

The areas under crop were:—  Summer rice	Feddam. 41,843 261,008
The available supply was:—  Rayyah Behera	Cubic metros per day. 7,700,000 900,600
Deduct for Alexandria water supply	8,600,000 45,000
Total discharge available	8,555,000
The general duty is, therefore, $\frac{8,555,000}{41,843 \times 2 + 261,098} =$	248 cubic metre

The following table compares the above results:-

	General data	Bire duty
Lower Egypt as a whole	25*9 25*5 27*40 24*80	51*80 51*00 54*80 49*60

As noted before, the 3rd Circle got slightly less than its share (based on the crop figures of 1901) of the discharge at the Delta Barrage, but this fact only accounts for a portion of the difference in its general duty as compared with the other Circles, which is also largely due to the fact that its rice area has quadrupled since 1901, while the 1st and 2nd Circles only show increases of 80% and 90% in their rice areas when compared with the same year. The result is that the area used in calculating the general duty for 1908 in the 3rd Circle has increased by 25% as compared with 1901, while in the same time, the areas used for calculating the general duty in the 1st and 2nd Circles have only increased by 7% and 4½% respectively. The proportions allotted to the several Circles will have to be recast in the light of the above facts.

The yield of the cotton crops will probably reach 6,500,000 kantars. The arrivals at Alexandria up to the 31st May have been 6,276,283 kantars against 5,659,785 kantars for the same date in 1902. The total

of the crop for 1902, which is taken as the arrivals reported up to the 31st August, was 5,838,790 kantars, so a further receipt of about 250,000 kantars before the 31st August 1904 may be expected, probably more as the cotton has been coming in faster than during the same period last year. The crop, therefore, has only been surpassed by the 1897 crop of 6,566,487 kantars. The area under cotton is given as follows:—

Upper Egypt Lower Egypt	***	***	9 W 1	***	***	***	***	# 9 P	***	Feddans. 146,367 1,186,143
						Tota	al	0 10 11	5 0 0	1,332,510

Assuming a crop of 6,500,000 kantars this gives a yield of 4.87 kantars per feddan. By comparing this yield with the figures in the table, on page 163 of last year's report, showing the estimated yields per feddan in Lower Egypt since 1894, it would appear that it is slightly over the average. Now in November it was generally stated that the yield was from 15 to 20°/, below the average, the reason given being the low temperature which was obtained during the summer. A mild autumn with few fogs had, however, in some degree compensated for the want of summer heat. It is rare to hear of a favourable cotton season. Cold summers, foggy autumns and short water supply being in turn advanced as reasons for anticipating short yields, so no great reliance is to be placed on these rumours. However, the reports of short yield were so persistent last autumn that it seems reasonable to suppose that the yield was actually rather under than over the average and to look for the explanation of the almost bumper crop in increased area, and this is probably the correct explanation.

With rotations greatly relaxed before the end of June, and removed altogether early in July, it is impossible to say that the crop suffered from short supply. In fact some there are who assert that it suffered from a plethora of water. Before the advent of the Delta Barrage weirs the period of greatest trial for the summer crops was from the middle of July to the middle of August. In the past year the water supply during this period was unrestricted. Unfavourable climatic conditions may have affected the out turn, but, as noted above, nearly every crop is said to suffer from unfavourable climatic conditions.

Comparing the estimated outturn with the outturn of 6,369,911 kantars in 1901, a year of short supply and severe rotations, I think the conclusion to be deduced is that a relaxation of rotations and consequent

lower water duty is not likely to yield as good results as the maintenance of a fairly severe rotation, such as one with a 21-day period, and consequent greater economy of water resulting in larger areas.

Appendix E gives the statement of crop furnished by the Ministry of Finance.

Below are compared the areas under crop in 1902 and 1903:-

WINTER CROPS.		Chops.	SUMMER	UROPS.	NIEI (	(1	
YEAU.	The Delia	(14%+)1.	The Builta	Gianh.	The Delta.	Gireh.	CARDENS
			1,366,009				11.235 12,348

As noted before, in the case of the rice crop, the areas are probably under-estimated. The early removal of the Sharaki Decree and the abundant supply in July gave the dhourra crop a chance it has not had for years, and the crop was a plentiful one.

The areas actually under cultivation are given as follows:-

YEAR.	The Della.	Ginelt.	Total.		
1902	3,070,789	180,986	3.251,775		
1903	3,069,214	172,100	3,241,314		

The difference exists in Gizeh Province in which the uncultivated area is now returned as 28,159 feddans against 11.753 feddans last year.

#### CHAPTER II.

#### FLOOD IRRIGATION.

As noted before, the early rise, which resulted in good summer levels at the Delta Barrage in June, was followed by a check and the flood was a late one, and very similar to those of 1900 and 1901. After the level of 15.50 was reached upstream of the Delta Barrage, the usual procedure of allowing the level downstream to rise 4 centi-

metres for each rise of 1 centimetre upstream was followed. The levels thus attained were as follows:-

DAS	7 12								EVEL UPSTREAM OF BUSETTA BARRAGE
July 3r		21.40	yr4-B	644	043	9 0° E		448	15.50
	10th	90.0	n 0-0	0.68		140	20-0-0	944	15.50
*4	15thm	0111	* 4 4	001	0.70	+0-0	840	***	15.62
*4	20th			44.0		888	004		15.97
	31 45	400		000		200		0.04	16.43

The Barrage was fully open by the end of August by which date the canals were all drawing their full flood supplies. The level upstream of the Barrage fluctuated between 16.20 and 16.50 during September, and rose again under the influence of the discharge from the Upper Egypt basins till it touched 16.93 on 25th October.

#### FLOOD ROTATIONS.

Flood rotations, which mean regulation so as to give alternate periods of high and low supply in each distributary, or each reach of the main and branch canals, commenced in August. These rotations vary slightly according to circumstances in each circle. In the 2nd Circle they commenced with alternate periods of high and low levels of 7 days each, and in October were modified so as to give 5 days of high and ten days of low levels. The advantages gained by these rotations are increase of flow irrigation and improvement of drainage.

#### REGULATION ON ZIFTA BARRAGE.

Zifta Barrage, which had been inaugurated in March, was regulated on throughout the summer, and yielded small supplies in the Rayah Abbas for short intervals, during the periods when the operations of rotations caused the level at its junction with the Bahr Shibin to fall sufficiently to create a draw through it. On the 7th July water began to reach Zifta from the Delta Barrage, which begins to pass forward water as soon as an upstream level of 15.50 is reached.

As the rise of the flood was slow, it was seen that some time must elapse before the Damietta branch would fill up sufficiently to feed the Rayah Abbas, without subjecting the new barrage to an excessive head, unless the small earthen sadd, which had been constructed below the latter at the beginning of the summer, were maintained. It was, therefore, decided only to pass such a discharge down the Damietta branch as the Rayah Abbas could dispose of, no water being allowed

to pass forward to wash away the small sadd referred to, till such time as it was possible to pass forward a supply heavy enough to fill the Damietta branch sufficiently to render the sadd unnecessary. This procedure was followed between the 3rd July and 14th August from which date the discharge reaching the Delta Barrages began to increase rapidly, and the river branches began to fill up. The Rayah Abbas began to draw a flood supply on the 14th July with a level up stream of the Barrage of 7.46. The maximum level reached before the down stream sadd disappeared, on 14th of August, was 8.60. The Barrage was fully open on the 30th August, when the upstream level reached 9.0-The maximum upstream level reached in September was 9.42, and in October 9.84. The Rayah Abbas continued to work up till the 15th October, from which date the supply coming down the Rayah Menufia was sufficient for the needs of Gharbia, and it was considered preferable to draw all the supply through the latter in order to maintain levels in it high, so as to afford as much flow irrigation as possible.

The discharge drawn by the Rayah Abbas from the 14th July to the end of August varied from 7½ to 8½ million cubic metres per day. The supply drawn by the Rayah Menufia from the 8th July up to the 15th August was almost constant at 25,000,000 c.m. per day. From the 15th August it began to increase till it reached its maximum of 33,761,000 c.m. on 22nd September. The level in the Rayah Abbas was reduced on the 1st September as the Rayah Menufia was then giving nearly all the supply required. The effect of the Zifta Barrage combined with the Rayah Abbas was, therefore, to increase the flood supply of the 2nd Circle by 30% during the latter half of July and August. This was a great boon rendering the early abandonment of rotations possible, and affording water for early sowings of dhourra and rice.

On the east of the river the new Mansuria Head was not completed. The old head began to draw water from the 19th July, but was closed again, owing to insufficient level between the 5th and 16th August. The Barrage was fully opened by the 31st August so the Mansuria canal, owing to the existence of the Zifta Barrage, drew a flood supply for 31 days during July and August.

The experience of the past season has, I think, shown that to obtain the full duty from the new barrage, a permanent weir is required down stream, so that the moment water is passed forward from the Delta Barrage it can be held up at Zifta to a level of 8.60 and passed into the canals on each bank. There is no navigation in the Damietta branch south of Cherbine during the summer, and a weir with automatic

shutters designed to fall when a depth of say 50 centimetres was passing over them suggests itself. This would ensure a level downstream of the barrage when the shutters fell, sufficient to prevent an excessive head, while maintaining a sufficiently high level above the Barrage to serve the Mansuria canal and Rayah Abbas.

#### BASIN AND FLOOD IRRIGATION WEST GIZEH.

Water entered the Girza head of the Lebeni canal on the 6th August, and Shabramant basin, through Abu Ninnos escape, on 13th August. The Giza canal head at Kafr Ahmar began to draw on the 15th August, and the Zumr canal on 10th August. The level at Manrqab regulator reached 23.10 on 30th August and was held at that till 3rd October. The level at Tama regulator reached 22.20 on 29th August and was held at that till 5th October. The level at Dashur regulator reached 21.80 on 3rd September and was held at that till 8th October. Saqqara regulator was kept tight shut till the 4th September, when the level had reached 20.80. Shabramant Manshia and Iswid basins continued to draw water through Abu Nimros escape till 15th September, when the escape ceasing to draw was closed. Tamam Rai levels were reached on the following dates:—

BASIS						DAT	TH OF BEACHING T.R. LEVEL.
Manrqab		 2 4 9	***		100	400	24th October,
Tama		 					2nd November.
Dashur		 400				144	30th October.
Suquara		 0.01	100		991		2141
Shabramar	11	 5.64			444		15th
Manshia		 200	040		100		30th .,
swill	000	 		***			8th November.
All hoshah	5	 	0 * 0	Bets	reen	31st	October and 10th November.

Water was drawn through Komi regulator between 22nd October and 8th November, when the heads of the Girza and Giza canals were closed, the basins brought up to T.R. levels and the hoshahs along the Giza canal flooded. It will thus be seen that all the basins drew the great bulk of their water directly from the river, only a little topping up of basins being done with the sarf water from Beni Suef, a matter for congratulation.

#### BASIN AND FLOOD IRRIGATION EAST GIZEH.

Water entered Khashab canal on the 12th August and the Ghamaza head, which feeds the lower reaches of the same canal below Ghamaza regulator, on the 19th August. The Ghamaza regulator was kept tightly closed till the end of October, when it was opened to complete the filling of the lower basins. The Kafr Tarkhan and Hagir canals, which take off above Ghamaza regulator, began to work on the 18th August. On the 10th September Ghamaza escape, upstream of the regulator, was partially opened to create a draw through the upper basins. This draw was kept up till 10th of October, which was very satisfactory. The Ghamaza feeder worked till the end of October, when the regulator above it was opened. Turah feeder (Maasara basin) and Der-el-Tin escape (Basateen basin) each drew in water for a few days in August. All the basins were filled in good time and kept at T.R. levels, or close to them, for from ten days to three weeks. The date on which T.R. levels was reached in each basin is given below.

BASIN DATE OF REACHING T.R. LEVEL.

Tabeen ... ... 6th October

The improved section in the head reach of the Khashab canal proved of great service and east Gizeh enjoyed better flood irrigation than it has done since the high flood of 1898. The only Sharaki area in the Province was a plot of 300 feddans in the Geziret El-Soul opposite Wasta.

#### SARF.

Nikla sadd was cut on the 9th November, a month earlier than in 1902, and the drainage of Iswid basin completed by the 17th idem. Girza head and Giza head, at Kafr El-Ahmar, were opened for drainage on 10th November, Abu Nimros escape was opened gradually from the 15th October. The sarf of the west Gizeh chain of basins was completed during the last week of November. The Giza canal boshahs were all laid dry by the middle of November. On the east of the river Ghannaza escape was opened on the 4th November. Turah feeder was opened for drainage on 23rd October. Der-el-Tin escape was partially opened for "takhfif" on the 12th October and fully opened on the 3rd of November. The sarf of east Gizeh was completed by the 20th of November. No cuts in the banks were found necessary for sarf, the new escapes and feeder heads proving sufficient.

#### FLOOD WATCHMEN.

The following statement shows the number of flood watchmen called out and the number of days spent by them on guard:—

Circle.			Number of men called out.	Number of days spent on guard.	Equivalent number of men for 100 days.
1st (Sirele 2nd Circle 3rd Circle Gizeh	* * * * * * * * * * * * * * * * * * *	000	375 909 58 937	6 17 -4 25	23 156 21 234
Total	0.01		2279		415

The numbers of Corvée guardians employed in Lower Egypt during the past four years have been as follows:—

YEAR.									2		r of watchmen r 100 days.
1899	***							 			726
1900										P = =	
1901	1.0.0	***	***	**1	8 8 9	401	***	 	•••	***	161
1902	0 0 0			0.00			* * *	 ***	* * *		110

The floods of 1900, 1901 and 1903 were very similar.

The policy of reducing the number of flood watchmen called out has, I think, been overdone during the past few years, and the result is to be seen in the ragged condition of the river banks in many places which, deprived of the usual protection of "libsch," have suffered severely from wave action, and will require considerable expenditure to restore them. It would seem advisable in the future to call out a moderate number of men at the beginning of each flood to protect the banks exposed to wave action by facing them with "libsch." Once this is done, only a few patrols are required, unless the flood proves to be a high one, when more watchmen would have to be called out for a short time later on in the season. The only place on the river banks which gave any trouble was Hassan El Malik, in Markaz Ashmoun Menufia, on the Rosetta Branch. It is proposed to make a diversion here in 1904.

#### NILE GAUGE OBSERVATIONS.

Marked rises commenced at Khartoum on the following dates:-

Óв	21st May	with a	gauge reading	g of		 	()*14
On	1st July	77	77				1.24
On	31st July	49	91		404	 	3:54

The above rises made themselves apparent at the Delta Barrage on the following dates:—

The maximum gauge reading recorded at Khartoum was 6:30 on the 2nd September; the corresponding maximum levels occurred at Aswan on the 12th September or after 10 days, and the Delta Barrage on the 16th September or after 14 days. The maximum gauge recorded at Aswan was 16P-6K on 27th September which agrees exactly with the mean maximum. The maximum reading reached on the Rodah gauge was 22P-9K on 25th October, which gave a level of 16:93 upstream of the Barrage. The levels were due to the Upper Egypt Basin discharges, which came on a falling flood.

### LAKE VICTORIA NYANZA GAUGES.

A communication lately received from the Survey Department states that, owing to the gauges on lake Victoria Nyanza having been moved, the following corrections should be applied, 17 centimetres or 6".7 should be deducted from the readings of Kisumu gauge subsequent to August 1899, and 28 centimetres or 11" should be deducted from the readings of Jinja gauge subsequent to 21st December 1901. The Entebbé gauge was re-erected after an interval of 5 months in October 1901 at too high a level, but the amount of correction is not known. Hence the Entebbé gauge readings before and after 1901 cannot be compared.

Applying these corrections to the readings given on page 172 of last year's report and adding the readings for 1903 we arrive at the following statement:—

YEAR	Part Alter (Entubbe).	Port Victoria Kesama.	Jinja.	
1st October, 1898 1st October, 1899 1st October, 1900 1st October, 1901 1st October, 1902 1st October, 1903 31st December, 1903	2 6½ 1 7 - 3 5 5 9¼	Ft. In.  3 2½ 1 0.6 0 6.3 1 1.3 1 1.3 2 9.3	8t In.  3 14 1 5 1 0 1 5 1 4 3 4 3 9	

The difference between the readings of the Kisumu and Jinja gauges for 1903 as compared with the years 1899-1901, seem to favour the idea that other unrecorded alterations have taken place. It is proposed in future to record the level on the Kisumu gauge, which is the only one which has a bench mark near it, and to take the reading of 31st December 1903 as 1.50 metres or 4.11.

The mean levels of the lake at the Kisumu gauge as corrected since 1896 are given as follows:—

YEAR.									Menn level Isumu gnuge.
1896			2 * 0	 	100	400	000	100	0r928 metres
1897							111		Incomplete
1898				0.0.5			0.0.2	9 40 4	0°748
1999						• • •			0.301
1901	***	***							0.208
1902	***						504	201	0°172
1903		***	100	 					0.731

#### CHAPTER III.

#### DRAINAGE

The maintenance of drains becomes daily of more importance. Many hundreds of kilometres of new drainage channels have been made in the Delta during the past seven years. In the annual report of 1898, page 147, will be found some remarks as to the expenditure required to keep the drainage channels in the Delta in fair working order. The estimate of the requirements at that time was L.E.33,000 and the kilometrage to be maintained has increased considerably since then. Now the total expenditure on maintenance of drains during 1903 only amounted to L.E.8174 or about 6% of the amount spent on the earthwork, exclusive of dredging in the maintenance of canals. The sum available for maintenance has been considerably reduced since that year, while the kilometrage of channels to be maintained has gone up by leaps and bounds.

Great efforts have been made of recent years to not only clear the beds of canals but recast the sections, and make up the dilapidated banks, so as to render the channels capable of passing an ordinary flood supply. A large proportion of the cube of earthwork executed under the head of maintenance is due to this making up of banks. This is satisfactory in itself and the fact that it can be done is due to the greater results at present obtained for the same expenditure, owing to more and stricter supervision by reliable officers on contract work, than was the case some years ago. Meanwhile the drains suffer. As the more pressing cases of remodelling canal banks are dealt with, it is to be hoped that a larger proportion of the maintenance expenditure will be devoted to drains. It is also to be earnestly desired that the sums available for maintenance will gradually be increased. For every feddan of land reclaimed and brought under cultivation a corresponding increase to the budget should be made for the maintenance of the canals and drains serving the reclaimed area and rending it cultivable and contributory to the taxes. It must be remembered that, unless drainage is liberally provided for, reclaimed areas will relapse, and produce, and the returns from taxation fall off.

The weed growth in some of the drains gives much trouble and the latter will doubtless be a perennial one. The conditions under which a drainage channel works being peculiarly favourable to the production of such a growth. A steam weed cutter, which has given good results in England, is now being ordered for trial on the drains in the 1st

Circle, which, it is to be hoped, may prove successful.

The question of rotations in drains was raised in last year's report and denounced. The Inspectors of the 1st and 3rd Circles have a good deal to say on the subject. Granted a perfect system of irrigation outlets and drainage inlets, cultivators who used their drains intelligently, and drains of suitable section, rotations would not be necessary and would be objectionable. Properly proportioned drainage inlets would force cultivators to close off their water supply when not required, and would discourage excessive flooding of land. In the absence of the above conditions over large areas, Inspectors will doubtless continue to be forced by circumstances to occasionally impose rotations on drains, to prevent swamping of land, as the lesser of two evils. The Inspector of the 3rd Circle writes as follows on the subject:

"In this province there are many low lying parts, and in large tracts there are not works of drains, and unless we had some control over them, it would mean excessive waste of water, high levels in drains resulting in damage to lands and higher levels in lake Mariotis with increased pumping at Mex. I know that proper outlets and rotations are the sarest way of avoiding these evils, but the construction of outlets on a large scale means large expenditure, and the work can

only be done gradually with the funds available. Canal (high and low level) rotations are steadily enforced and are of great benefit in flood and winter; but they are not sufficient when the drains are so close to the canals and water courses, and we have found that in the peculiar circumstances in the province, the drain rotations are most beneficial, they keep drains low, and help to avoid waste and damage to lands. The main and branch drains are not sadded, only the private drains discharging into them; the rotations are made to fit in with the canal rotations and work excellently. One of the proofs of this is that the people now have a strong desire for these drain rotations, as they get better drainage for their low lands, and we have no complaints whatever".

After an absence of 4 years, I have lately inspected a considerable portion of the Behera Province. The improvement visible on all sides due to improved drainage is very marked. Large areas of what I remember, as marsh in the vicinity of Hosh Issa, Delingat, Damanhour and Rahmanieh, are now quite dry and rapidly coming under cultivation. It is stated that some 25,000 feddans have recently been added to the cultivated area in the province; unfortunately there are no reliable returns to show progress. The deep cuvette out in the centre of Khairy drain has proved successful and kept a clear central channel with good velocity. Weed growth was noticeable in places, but the big drains in the first circle seem to suffer more in this respect.

# MEX PUMPING STATION.

The following statement shows the results obtained at Mex Pumping Station and compares them with those of the seven previous years:—

SEASIN	Quantity pumped.	Cuel	Rate per taillion cufes metre- pumped.	Price of con- per ten.
	C.M	1, 11.		ELM.
1895-1896 1896-1897 1897-1898 1898-1899 1899-1900 1900-1901 1901-1902 1902-1903	175,078,166 216,994,810 227,429,530 284,896,064 202,987,741 316,435,869 384,946,043 396,420,022	7,588 8,068 8,675 8,378 9,391 14,182 13,297 12,247	43.004 37.000 38.000 30.000 46.261 44.818 34.548 32.205	1 - 237 1 - 678 1 - 746 1 - 286 1 - 200

The quantity was a record, but was little in excess of the previous year. The rainfall of the season 1902-1903 was 11-27 ins., against 8:55 ins. in 1901-1902, so the small increase must be regarded as satisfactory. Pumping commenced on the 23rd September 1902 and stopped on the 30th April 1903. The price of coal was lower than it has been for five years, and the cost of pumping is the lowest since 1898-1899. The results of the first three seasons in the list cannot be compared with those which follow, as during them a large portion of the pumping was paid for at contract rates which the price of fuel did not affect. The statement which follows shows details of rainfall and maximum and minimum levels of the lake for the past 8 years. It will be noticed that the maximum level has fallen considerably, while the minimum has risen, the difference between the maximum and minimum level for the past season being only 0.33 against 1.0 metre in 1895-1896 and 1899-1900. This result may be attributed to increase of summer irrigation, development of the drainage system for which the lake forms the outfall, and better regulation of flood and winter supplies in the canals. On Plate IV will be found a gauge diagram for the lake for a few selected years.

Season.	Rainfall	Maximum to col od lake.	Date of maximum level.	Minimum level of lake.	Pate of minimum havel.
1895-1896 1896-1897 1897-1898 1898-1899 1899-1900 1900-1901 1901-1902 1902-1903	10:45 8:53 13:94 11:88 8:28 10:08 8:55 11:27	-215 -203 -217 -195 -228 -231 -241	17th March. 7th Junuary. 23rd January. & 13th March. 18th Feb. 27th Junuary. 19th January. 4th & 25th Jan. 23rd January.	$\begin{array}{r} -3.15 \\ -2.32 \\ -3.20 \\ -3.26 \\ -3.29 \\ -3.23 \\ -2.85 \\ -2.78 \end{array}$	22nd August, 11th Sept, 27th August, 16th Sept, 11th August, 17th August, 16th August, 16th August, 16th July,

The expenditure incurred during the year on working the pumping station was L.E.13,540. A sum of L.E.377.0 was also spent on extra quarters for the staff, making the total expenditure for the year L.E.13,917.00

## CHAPTER IV.

# NEW WORKS OF IRRIGATION AND DRAINAGE AND WORKS CHARGED TO SUNDRY SPECIAL CREDITS.

The following statements show the Caisse Credits available for expenditure on special works during the year, the actual expenditure incurred and the balances to be carried forward:—

Cabser Credits, 1903, by Circles.

	Balatter from 1902.	Allmanums ter 1003.	Total.	Mrs III	Texanimila Laure.	Dalates to curry forward.
	L.R. M.	L.R. 31.	LE. M.	116. 31.	LE M.	L.E. M.
1st Circle.						
trigation Improvement: Luminage, Substituty Works and Zifta Barrage	12,000.007	63,500,000	76,999,987	76,890 but	53,278,910	23,120,388
Ilumietta Sadd	306.455	550,000	866.485	300,485	306 455	2,735
Special Low Nile		250,000	281,657 234,010	281,657 250,000	728 965	27/1/(00)
Exhet El Borg	2.100.711	-	2,160,711	2,460.744	2,439,711	1,000
Testal	15,727.106	14,300,000	79,738,823	70 738 S28	56,384,100	29,371,728
2nd Circle.						
Irrigation Improvement: Unitage, Subsidiary Works	9.911.870	62 THOUSE HOUSE	75.911.870	73.911.870	44,469,317	32.032.555
law XIIe		SER), CORO	800,000	341.348	343 426	1.122
law Pluid		207,600	517,000	547,010	369.111	177,889
Total	9,911 870	GA 16,17 46 111	75,258,870	74,888 418	41,471.864	33,131,544
3rd (Svote,						
Irrigation Improvement:						
Iminogo	8.273,821	\$3,900,000 9,000,000	9,000,000	9,100 (,000)	37.110.501 7.870.781	1.120.910
Mon Nile	E differ france	2,448,000	2,400,000	725.092	725,648	63, 3114
Law Klim Atf Pumps)	1,002,508	4940.400	1 462,560	\$,662,593 990,660	\$,110,073 203,568	314, (32
Testal	7,986.711	55,(BID,(WH)	62,930,514	61,262.5an	50,021 474	TL211/02
Dolta Barrege,						
Irrigation Improvement		6,500,000	10,646,797	10,646,782	9,818,162	828,323
Low Fluid		250,000	250,4800 —	1,5(m),808	717.224	770.070
Fotal	Loig 787	6,230 000	10,896,787	12,147,780	10,365,686	1,581,1001
						-
Zifta Barrage	10,650,744	50,000,000	00,859,744	99,639 744	84,387 819	13,271,925
Sulmidiney Works		(S, Testa, es(m)				817.441
Total	49,859,744	53,500,0940	103,870.744	108.359.744	87,270,378	leigher mini
Grand Totals	H# THE THE !	244.147.4HH	SB2.210.788	881,332,081	815,913 (9 <u>9</u>	×5,418,589
			*		-	

# Caisse Chedits, 1903.

	Relabor from 1 mg	Original alletment, 1902.	Total.	Modities.	Expen- diture.	Balanco to carry berward.
	L.E. M.	L.E. M.	E F. 51	Position Atla	I.E. M	fan Br. M.
Irrigation Improvements.  tet Circle	9,1608 882 3,927,701 2,402,737 4,646.787	14,7800,000 27,000,000 19,000,000 6,000,000	28,598,882 30,927,701 21,402,737 10,646,787	23,598,8%2 30,927,701 18,202,787 10,440,787	17,718,738 14,800,900 11,170,073 9,818,162	5,885,144 16,096,751 6,783,668 825,725
Tetals	20,076,107	add Talantenia	86,576,107	81,376,107	53,842 200	29,500,442
Sulaidiary Warks Zifto Barrage.  Ist Circle.	_	1,000,000	4,000,000	4,000,000	-	4,000,000
Zifta Barrage		8,800.000	S, Janson H.	8,800,000	2 652 502	817.441
Tutals		7,300,000	T <sub>e</sub> Zent en ex	7,500.000	2.652,559	4,817.441
Drainage.  let Circle	8,801.055 5,984.1d9 871.184	25,000,000 37,000,000 24,000,000		28,801,033 12,984,169 28,071,184	21,553,951 26,128,367 25,631,420	7,247,104 16,855,802 2,489,756
Totals	10,650,408	COOLUNE, DIS	teritalist grass	99,856,469	73.313.747	26,542,661
Totals: Irrigation Improve- ments, Drainage Subsidiary Works	30,782.515	160,000,000	190,732,515	100,732,314	129,538,531	00.898.984
Zifta Barrage	49,859.744	50,000,000 20,000,000	99,839,744 20,000,000	99,859.744 20,000,000	84,587,819 14,011,200	15,271,925 5,988,740
Totala	49,859.744	70,000,000	119,889.744	119,859 744	98,500 070	21,260,646
Mehallet El Amir Sadd Sadds Damletta arregus	360.485	Д,гиз,гинз —	9,000,000 366,487	O CHRESTORS SHIELDS	7,870,781 006,185	1,129,210
Totals	366,185	9,000,000	9,866,485	Millerdia for	8,237,246	1,129.219
Special Law Nile Coudit.  Let Circle 2nd Circle 3rd Circle (Atfeh) Barrage	4,662,593	550,000 800,000 2,400,000 250,000	1'ers 2 m 3'885'oon 800 me	743.185 447.446 200.627 500.627 603.200,1	275.022 843,426 725,648 4,110,978	2.735 1.422 0.344 551.620
Potuls	4,862.308	4,000,000	8,394,250	6,014,790	6,168.169	156,656
Special Law Flowd Ordit.  1st Circle	_	250,000 297,000 600,000	547,000	547,000	2017/08	250 000 177,880 390 4,82 768,579
Tatals	-	1,147,000	1,397,000	2,397.800	1,319,403	1,577,3000
Ezbet el lkng Reservoir	2,460.741	-	2,300.711	2,160.711	2,450,744	1,000
Grand Totals	88,082,081	244.117	332,210,738	180 288,1EE	245,713,192	
	1		1		,331,33	

The total sum under the head of Caisse Credits available for expenditure during the year was L.E. 331,332 and the actual expenditure incurred was L.E. 245,913, leaving a balance of L.E. 85,419 to be carried forward. A large proportion of this balance is due for land taken up, as payments for land proceed slowly, only a small portion of land taken up in any year being paid for during the same year. In addition to the above sum of L.E.245,913,a sum of L.E.41,952 provided from the Ordinary Budget, including a sum of L.E.1,112 realized by the sale of old materials at the site of Zifta Barrage, was spent on Special works raising the total expenditure on the latter to L.E. 287,865.

This expenditure was divided between the Circles as follows:-

CIROLE.			Irrigation Improvements.	Drainage Works.	Sundry Special Works.	Total,
1st Circle 2nd Circle 3rd Circle Delta Barrage Zifta Barrage Total	000	000	38,188 35,546 14,492 12,747 89,831	25,812 26,732 27,091 — 79,635	3,105 713 12,911 747 —	67,055 62,991 54,494 13,494 89,831 287,865

## IRRIGATION IMPROVEMENTS-1ST CIRCLE.

The following statement gives the list of works carried out in the 1st Circle under the head of Irrigation Improvements and the expenditure incurred on each:—

Namh		Expenditure.					
New Head Ismailia Canal							8,002
Syriakos by wash				***	444		726
Spurs Rayyah Tewfiki and	Dala 1	Manager	***	* 4 0	***	***	2,802
Extension of Um Galagil C	rant 1		10 00	9.6.0	0.00		824
Extension of Chazali Canal	TERRET	0 0 0	***			300	1,253
urchase of materials for s		***			000	***	1,600
		531				***	
apply and erection of Bon	maary	Stone	3		0 4 4	***	437
iew Regulators Sharkia ar	1d Dak	SETTIFIES.		10.00			1.335
ail escape Kenneba ('anal				Ann		4 0 0 1	246
Suppression of Bowlakia Ca	anal	800			0 0 1		271
Purchase of land areas 190		919.0		0.00			44.5
Moving work shop of Dred	ging C	ompai	ay Si	mbra	5.00	100	1,400
Zifta Barrage Sudsidiary V	Vorks	***				100	14,632
Establishment and Surveys	5						4.215
		T	otal		***		38,188

Of the above sum, L.E.31,725 was charged against Caisse Credits and L.E.6,463 against Ordinary Budget.

Ismailia Canal New Head.—This work was described at length in the last two reports. It has now been satisfactorily completed and was used for regulation during the past flood. Through navigation down the Ismailia and Suez Canals has thus been established throughout the year, and the power of regulating the discharges admitted to these canals placed under complete control. The total cost of the work has been L.E.31,141.

Syriakos By Wash. Ismailia Canal.—This work was built in 1902. The work done during the past year was completion of the channel and connecting up with the main canal; water can now be passed down the canal without opening the lock gates, a great improvement as regards regulation. The total expenditure has been L.E.9,758.

Spurs Rayyah Tewjiki and Bahr Moes.—Spurs have now been completed from kilometre 1 to kilometre 8, and from kilometre 26 to kilometre 28 in the Rayyah Tewfiki; 20 spurs have also been built in the Bahr Moes. Similar spurs have done a great deal for the Ibrahimieh Canal and Rayyah Menufia.

Extension of Om Galagil Canal,—This work was started last year and has now been completed; it includes 6 kilometres of new and 4 of remodelled channel. The canal serves an area of 15,000 feddans in Markazes Miniet Samanoud and Mansurah in Sharkia Province. The expenditure to date has been L.E.2,258. The final account has not yet been submitted.

Ghazali Canal Extension.—This is a small branch of the Bahr Faqus in the extreme north of Sharkia. It has been extended 9 kilometres to bring water within reach of the San-el-Hagar village, which previously had to depend on drainage water.

Purchase of Materials.—The surplus materials at Ismailia canal head were purchased for stock.

Regulators Sharkia and Dakahlia.—They included the following small masonry works:—

Head Sluice Mahmoud Pasha Taher Canal.

- .. Bordein Canal.
- .. Hafiz Pacha Canal.
- . Morabia Canal.
- . Sura Canal.

Regulator on Saarana Canal.

., Mostagadda Canal.

These are all most useful petty works bringing the supply of the above channels under control, thus improving irrigation and preventing flooding and waste of water.

Tail Escape Kenneba Canal.—This work replaces a sadd which was made and removed yearly.

Bulakia Canal Suppression.—This canal is being suppressed on sanitary grounds. A credit was granted for this work in 1902 and a commencement made. No further credit was forthcoming till the end of 1903, so the work was not completed. It will be taken up again in 1904.

Moving Dredging Work Shops Shubra.—These shops occupied the right bank of the Ismailia Canal below the new head and lock and obstructed traffic. The fleet of dredgers also blocked the canal. The expenditure represents the sum paid to the Dredging Company for shifting the shops to the left bank of the canal on to the plot included between the new head and the diversion channel where there is no traffic to be interfered with. The diversion channel will serve as a basin for the dredgers and relieve the main channel, on which the navigation has greatly increased since the construction of the new lock.

Zifta Barrage Subsidiary Works.—The following statement enumerates the works carried out under this head which consist of the Zaglula and Mit Mohsen Feeder and the Om Salamah-Buhia junction channel with their contingent works:—

NAME OF WORK.		Expenditume.
Laglula and Mit Molsen junction channel		278
lead to Mit Mohsen junction channel		1.774
Right Gannabia Head on junction channel	0.50	494
fit Mohsen Canal Head on "		350
Im Salama Syphon	0.010	2,425
Mansuria Syphon		3,398
ight Railway Bridge Om Salama Canal		742
Making and removing Light Railway Bank		415
Im Salama Buhin junction channel		1,709
Regulators at Baramtush where junction channel joins	the	
Buhia Canal	***	4,244
Head Sluice for Om Salamah Canal below off-take of	new	
junction channel		421
Hend Sluice Sanafa Canal Branch of Om Salamah	Mit	
Mohsen junction channel	• • •	158
Head Sluice Abid ('anal, a branch of the same		217
Shonfas Drain syphon Om Salamah Buhia junction		379
Seven timber bridges		797
lost of Stone	100	260
Murble gauges		38
Total		17,699
Dadust paid in 1009		3,067
Deduct paid in 1792	-	. 54, 77, 6
Expenditure in 1903		14,632
Expenditure in 1300	***	1 1.11/1/20

The Zagloula Mit Mohsen Feeder takes off above Mit Ghamr Regulator and syphons under the Um Salamah and Mansuria Canals to feed the Zagloula Canal, which serves the land between the Mansuria Canal and the Nile. On this channel are built heads for a proposed new high level canal on east of the Mansuria, and the existing Gannabiah Mit Mohsen, also for the Sanafa and Abid Canals. The object of these works is to supply water from above Mit Ghamr Regulator to land south of Sannayta between the Nile and Buhia Canal. The head of this feeder consists of one vent of 3 metre span with regulating gate. The Om Salamah syphon consists of 3 pipes of 1.5 diameter, and the Mansuria syphon of 3 pipes of 1.02 diametre. The Light Railway was diverted from the right bank of the Mansuria Canal on to the right bank of the new feeder, being carried over the Om Salamah Canal by a girder bridge of 15 metre span. By this means a bridge over the new feeder, extensive alterations to the Um Salamah Head, and extension of the Mansuria syphon, were avoided. The Om Salamah Buhia junction, 4 kilometres in length, will feed the Buhia Canal with water taken in from the river at Zifta. The

principal works in connection with it are the 2 regulators at its junction with the Buhia Canal, each consisting of 3 vents of 3 metre span. Below the off-take of the junction channel comes a head for the tail portion of the Om Salamah Canal, now considered a branch. The Shonfas Drain Syphon under the Om Salamah Buhia junction, and 7 timber bridges complete the list of works.

# IRRIGATION IMPROVEMENTS-2ND CIRCLE.

The following statement gives the works carried out under the head of Irrigation Improvements—2nd Circle.

Name of work.	Expenditure.
PAR OF WORK.	
	L.E.
Remodelling Baguria and Sirsawia Heads	3,023
Remodelling Qoddaba and Bassiun Regulators	2,462
Nagail Canal Project	11,244
Remodelling and extending Radi Canal	1,745
Salahib Canal	3,230
Pipe syphons Mitherra Canal	1,174
Remodelling and extending Telwana Canal	1,380
Outlets on first 4 kilometres of Bahr Saidi left bank	435
I wo regulators on Masraf Babeel	663
Potty Regulators in Gharbia	999
Remodelling Mithern Regulator	250
Regulating Doors for outlet heads	60
Sharkia Canal head	418
Mehalla Kebir Irrigation House	700
mproving upstream approaches Baguria Lock	492
Haps of Charbin	300
Annex to Office Shibin El Kom	7-3
Store houses and ghaffirs hots Nanaia and Bagonria Hends	361
Kom Ali Regulator Bahr Smilla	202
Purchase of grooves, etc	132
Railing round Government land Kafr Zayat	50
Four small Regulators Menufia (arrears)	33
Tail regulator Bahr Biela	116
Regulator- in Menufia (arrears)	159
Melig Canal	880
Combined Road and Railway Bridge Bassium	140
Brick burning for new works	2,980
Supply of ironwork by Arsenal	1,000
Establishment	726
LEITHES LEEP DEGROOM-ON VIV	
Total	35,546

Of the above total, L.E.16,027 was charged against Caisse Credits and L.E.19,519 against Ordinary Budget.

Baguria and Sirsawia Heads.—These were old-type works with imperfect regulation with vertical timbers. They have been repaired and remodelled, so that regulation may be effected by iron gates worked by a travelling winch.

Bassium and Qoddaba Regulators.—These important regulators on the Baguria and Qodaba Canals have also been modified so that regulation may be effected by means of gates and winches.

Nagail Canal Project.—Work on this project was started in 1901. It provides for the flood irrigation of a large area in Menufia and already has proved of much value, obviating the necessity of heavy flood regulation in the Rayyah Menufia and its upper branches. The expenditure to date has been L.E.24,477.

Remodelling and Extending Radi Canal.—This project will do for the high land on the east of the Rayyah Menufia what the Nagail Canal has done for the land on the west of it.

Salahib Canal.—This is a high level distributary along the Bahr Tirah below Salahib three kilometres in length.

Miterba Syphons.—These syphons were completed in 1902 in connection with the Mischerif Flood Canal; the total expenditure to date has been L.E.2,830.

Tehwana Canal.—Is another important flood canal in Menufia which has been remodelled and extended.

Melig Canal.—The old Ghuri Canal and West Ghannabiyah Melig have been joined up into one channel called the Melig Canal, which will serve during flood a large area between the Kassid Canal and Bahr Shibin.

The list also includes 10 small regulators, a few buildings and the provision of materials for projected works.

#### IRRIGATION IMPROVEMENTS-3RD CIRCLE.

The irrigation improvements in the 3rd Circle are given in the following statement:—

NAME OF WORK.	EXPENDITUBE		
			LFL
emodelling Bashqun Canal			4,450
emodelling Edkawia Canal			852
emodelling Culverts on Mahmudia Canal		000	2,891
xtending Weirs Kafr Bulin Escape			560
emodelling Kafr Bulin Regulator			1,314
Hrvey			682
ayments for lands			730
lest Houses Hosh Issa, Delingat und Rosetta			1,399
lest House Damanhour and Maadia			203
Survey Nubaria Canal			450
Supply Pipes for Baslaqun Canal			277
Fixing Boundary Stones			140
Additions to Head of Khatatbah Flood Feeder	***		384
Supply pipes for Kafr Bulin Regulator			160
Total	0.0.0		14,972

Of the above expenditure, L.E. 11,479 was charged against Caisse Credits and L.E. 3,013 against Ordinary Budget.

Remodelling Baslaqun Canal.—The Baslaqun Canal is an important branch of the Mahmudia; it has been entirely remodelled on a length of 13 kilometres and is now capable of irrigating 13,000 feddans:—

Remodelling Edkawia Canal.—This is also a branch of the Mahmudia; it has been remodelled on a length of 2 kilometres.

Remodelling Culverts Mahmudia Canal.—48 irrigation sluices have been remodelled or replaced by new ones, and 16 sluices, found in excess of requirements, have been removed entirely. This is a most important improvement, affording greatly increased control over irrigation, and thus preventing waste of water and flooding of land.

Extending Weirs Kafr Bulin Escape.—The diaphragm walls of these weirs have been lengthened so as to tie well into the banks.

The dry stone floors were also extended. These weirs have been quite successful in arresting the deterioration of the escape channel.

Remodelling Kajr Bulin Regulator.—It has long been recognized that a new regulator provided with gates was required to replace the tumble down structure at Kafr Bulin. A start was made with the collection of materials and other preliminaries.

The other items in the list call for no special remarks.

IRRIGATION IMPROVEMENTS .- DELTA BARRAGE DIRECTORATE.

The following is a statement of the irrigation improvements executed in the Delta Barrage Directorate:—

NAME OF WORK.		ExpEXDITURE.		
				L.E.
ollection of materials for proposed Wards	m Lock			1,135 800
ampleting Rayvah Behera Head	000 000			
Completing Rayyah Behera Head Completing Nikhla Regulator Rayyah Beh	14-1731	4 5 5		265
urvey	4.00			150
Sarrage Inanguration				578
Lamodelling Khashah Canal				5,993
temodelling Kafr Terkhan Canal			***	3,373
Establishment		* * *		453
	Total	• • •		12,747

Of the above expenditure, L.E. 9,818 was charged against Caisse Credits and L.E. 2,928 against Ordinary Budget.

Wardan Lock.—This work will be built in connection with the regulator at kilometre 21 of the Rayyah Behera, which canal will then be navigable throughout its length.

Khashab Canal.—The Khashab is the main flood canal of east Gizeh: its head reach was remodelled to a 10 0-metre bed on the first 5½ kilometres including a diversion of 2.8 kilometres. There was a marked improvement in the flood irrigation of east Gizeh consequent on this work, which will be continued in 1904.

Kafr Terkhan Canal.—This is a branch of the Khashab Canal. It was remodelled on a length of 10.8 kilometres.

## ZIFTA BARRAGE.

The expenditure in connection with Zifta Barrage and its subsidiary works was L.E. 89,831 distributed as follows:—

Zifta Barrage proper Rayyah Abbas and contingent	*** ***		21579
Mansuria Head	works	***	39016
101 000 001			L.E. 89830

The total expenditure up to date under the same heads has been as follows:—

Zifta Barrage proper	000 000	 	***	L.E. 287229
Rayyah Ablus and contingent	works	 		98017
Mansuria Mead				34724
	Total	 	L.E	.419970

The Barrage and the Rayyah Abbas were practically completed at the end of 1902, and the inauguration ceremony took place on the 7th March 1903. The expenditure shown was mostly on accounts of arrears from the previous years. These works have been fully described in previous reports and the utilization of the Barrage during flood has been described in Chapter II.

The Mansuria Head on the east of the river to feed the Mansuria Canal was built during the year. It is similar to the Rayyah Abbas Head and consists of 4 vents of 5 metres each and a lock 35m, 8m with double gates. Some expenditure incurred on iron work and joining up with the canal and river will appear in the Accounts for 1904.

## DRAINAGE WORKS-1ST CIRCLE.

Drainage Works.—The following is the detail of the expenditure on drainage works in the 1st Circle:—

NAME OF	Wonk						EXPENDITURE
							LE,
emodelling Bahr El Bagar dra	in .					***	9,457
emodelling Bahr Taweel	40 .	11		4 8 8		0.00	2,494
emodelling Mahsama Timsalı d	lrain .					***	7.046
lit El Amil drain							1,797
yphons under Suez Canal .		h m		4 0 0			1,496
			784				2,118
ost of land							1,000
ranch drain at Suez		4.6		900			46
onverting the old Saidia Head	into a	sypi	hon	100	100		358
			Tota	ıl	***	-	25,812

Of the above expenditure, L.E. 21,554 was charged against Caisse Credits and L.E. 4,258 against Ordinary Budget.

Bahr-El-Bayar and Taweel Drains,-The Bahr-El-Bagar Drain is the outfall for the drainage of 295,000 feddans, and the Bahr Taweel the outfall for 470,000 feddans in Sharkia and Dakahlia. The total length of the Bahr-El-Bagar is 85 kilometres. Work was started in 1897. The whole length of the drain has been widened to bed-widths varying from 14 to 20 metres. The last 50 kilometres are now being deepened by dredging. The progress to date is 18 kilometres, of which 7 kilometres were done last year. The Bahr Taweel proper is only 7 kilometres in length after which it divides into two main branches, the Bahr Fagus and the Hadus Drains. The whole length was originally dredged to a 50.0-metre bed-width with a bed level at the tail of 20 metre. The section of the channel is now being recast to a 40.0 metre bed width, the bed level at the tail being lowered to 30 metre. A length of 11 kilometre of the modified channel was completed during the year. A length of 2 kilometres of the main Bahr Faqus branch has also been remodelled during 1902 and 1903.

Mahsama Timsah Drain.—The work done during the year consisted in widening and deeping the first two kilometres of the drain; in replacing 3 pipe acqueducts by one syphon and a length of water course to facilitate dredging and obviate the necessity of lengthening the acqueducts; and in modifying existing acqueducts and bridges, so as to allow of the increase in the section of the drain. A new syphon of two pipes of 1.50 diametre each was built to carry the drain under the Suez Canal, the old syphon being too high.

Mit-el-Amel Drain.—This is an extension 6½ kilometres in length to serve the land between the Om Salama and Mansuria canals.

Syphons under the Suez Canal.—These syphons, two in number, are to dispose of drainage due to rainfall which banks up against the canal.

Extension of Bilbeis Drain.—The expenditure was incurred in paying off arrears for 1902 and in completing Abu Zabel syphon under the Ismailia Canal. Appendix F gives an interesting note by Mr. Molesworth on this work; an interesting example of the application of cement grouting.

Conversion of the Old Saidi Head into a syphon.—This is an old canal head under the Zagazig-Ismailia railway which it is proposed to convert into a drainage syphon by making bore holes in the floor, pumping out the sand from underneath, and replacing it by cement run in as grout. The floor thus thickened will then be cut down to the required level. So far as the work has gone it seems likely to prove successful.

#### DRAINAGE WORKS IN 2ND CIRCLE.

The following statement gives the detail of the expenditure on drainage works in the 2nd Circle:—

NAME OF	WORK,					EXPENDITURE.
						L.E.
Remodelling Batra drain	ev	***	• • v	5.04		2.189
Remodelling Samatay main drai	in	***	***			11,652
Remodelling Dahrin drain			***			2,154
Remodelling Abshan drain		o 0 0		P 0 0	***	2,152
Remodelling Waziria drain		b.0 0	. 4 0			3,526
Remodelling and extending Fua	-Orban	drain			204	1,404
Compensation for land and erop	[18	000	* 0 *			468
Surveys			220		***	956
Establishment	400		0 4 0			2.231
		To	tal		• • • •	26,732

Of the above expenditure, L.E. 24,932 was charged against Caisse Credits and L.E. 1,800 against Ordinary Budget.

In the six drains enumerated a length of 83 kilometres of channel was remodelled. The heaviest job was the Samatay Drain, and the result of the work has been most satisfactory. The Inspector of Irrigation 2nd Circle points out how necessary it is to continue re-casting the sections of all the main drains in a similar manner.

#### DRAINAGE WORKS IN 3RD CIRCLE.

The following statement gives the detail of the expenditure on drainage works in the 3rd Circle:—

NAME OF	Expenditure						
							L.E.
Remodelling Umum drain	9.54			***		0.14	3,940
Remodelling Damunhour drain.					***		1.808
The state of the s					***		1.813
lemodelling and extending Nul	lorin	deni	110				1.775
Consultance of the land of the land							5,410
vtamiling k hairi danin							3,016
Town release Come P. 1 t					***		1,536
10 P. 38 11 3		***		0.04	* * *	0 0 0	1,495
onstructing Mehallet Bishr dr	0 0 0		***		. 40		560
- C. D : IT:1-1 1. * 1		0.0				0.5.0	
car ben mai dram syphon .		* # *	* * *			***	804
orombay drain syphon		* * *	4 8 9			000	244
Istablishment and Survey				000		2.04	2,650
Payments for land	* * *		100				2,040
			Tot	al			27,091

Of the above expenditure, L.E. 25,631 was charged against Special Caisse Credits, and L.E. 1,460 against Ordinary Budget.

The Umum Drain.—The channel was remodelled on a length of 6 kilometres up to its junction with the Damanhour Drain.

The Damanhour Drain.—The channel was remodelled on a length of 5 kilometres from its junction with the Umum Drain.

The Nediba Drain.—The channel was remodelled throughout its entire length of 10.2 kilometres.

The Nubaria Drain.—The remodelling of the south branch was completed and a small branch 1.2 kilometres in length constructed joining in at the syphon under the Hagar Canal.

The Khairi Drain.—The main drain was extended 5.4 kilometres from the Gabares Drain junction in a south-westerly direction. The central channel was also widened and deepened in its upper reach.

Delingat and Rozaja Drains.—These are important branches of the Khairi Drain 12 kilometres and 4.1 kilometres in length.

The Kafr Beni Hilal Syphon carries the drain of the same name under the Damanhour Dessuq railway line. Kajr Melit Drain.—This drain starts on the north of the Mahmudia Canal opposite kilometre one and joins the Edku Drain at the crossing of the old Fransiwiyah Canal.

The Sorombay syphon carries the drain of the same name under

the Shaker canal.

Mehallet Bisher Drain.—This drain runs on the left boundary of the Sahel Markaz Canal to join the Miniet Salamah Drain.

The following statements show the lengths of new channels and existing channels remodelled under the heads of "Irrigation Improvements" and "Drainage Works," together with the cubes of earthwork by hand and dredging executed under each head and the cost of the same.

IRRIGATION IMPROVEMENTS.

	W Bed orkress.	chundelled chunel i Hamskee	EARTHWORE BY HAND. DREDGE			arna.	Total cost Earthwo. k
Cincle.	New chambel kilometre	Chin thin	Cube,	Cast.	Cabs.	Cost.	and Dreiging.
			C.M.	L.E.	C.M.	L.E.	L.E
1st 2nd 3rd Dolta Barrage	19°0 13°7 2°8	4.0 59.3 15.0 13.5	229,678 792,626 246,895 495,124	3 789 12 693 4 883 7 325		= =	3 789 12 693 4 883 7 325
Totals	35*5	91-8	1,764,323	28 690	_	_	28 690

#### DRAINAGE WORKS.

	New annel ametres.	channel channel ilometreu	EARTHWORK	K BYHAND.	Рики	uine,	Total Eartw	ork
CIRCLE.	New ohnmel kilometra	Hene elelled elemot kilometred	Cube.	Cassi.	Cube.	Cost.	Dredg	
			C.M.	L.E.	C.M.	Lilli	L.E	
1st 2nd 3rd	6*5 4*0 37*1	10*5 83*0 26*0	92,369 1,216,676 934,809	1 314 12 693 16 026	355,708 24,829 —	13,679(°) 844 —	14 13 16	993 537 026
Totals	47 - 13	119:5	2,243,854	30 033	380,537	14,523	41	556

<sup>(1)</sup> Includes L.E. 255 paid for work by the day at Aba Zabel Syphon; L.E. 425 work by day at Syrincos By wash: L.E. 905 paid on account for Masama Timeah Prain

#### EXPENDITURE ON SUNDRY CREDITS.

The following statement shows the expenditure on sundry credits which appear in Appendix A:—

Cincin	Name of Credit.	Amount.	How Spent
2nd Circle	Low Nile Damietta Sadd Ez. El Borg R. Low Nile Low Flood	279 366 2,460 344 369 7,871 4,836 204 747	Payments for land taken for sadd in 1902. Arrears for 1902. Working Rotations. Irrigation of river sahels.

The only item in the above which calls for remark is the expenditure of L.E. 4,836 against the Low Nile Credit in the 3rd Circle. Of this a sum of L.E. 4,111 was spent in roofing the engine and boiler houses of Atf Pumping Station and the purchase of three new boilers and replacing some gearing.

AGRICULTURAL ROADS.

The annual progress statement is given below:-

CIRCLE AND PROVI	NCE		Existing at und of 1902.	Added during 1903.	Total at end of 1908.	Expenditure. 1903.
1st Circle.			Kilom.	Kilom.	Kilom.	L.E.
Galiubia Sharkia Dakahlia	***		107 2024 2034	=	107 2024 2034	=
2nd Circle.  Menufia Gharbia		0.4.6	279 767	38	279 805	12,272 (*)
Behera Total		***	281\( \)		281½ 1,878½	12,272

<sup>(°)</sup> L.E. 2,957 arrears for land. 2,685 Dessuy Kobri Osman Road not completed and so not included in the statement.

## BRIDGES TO REPLACE FERRIES.

The following expenditure was incurred under the above head:-

1st Circle-Bridge on Buhia Canal at Toukh El Aklam 3rd Circle-Completing Swing Bridge on Khatatbah Canal	1.0	()(3
	L.E. 1,	720

EXPENDITURE ON BEHALF OF COMPANIES OR OTHER ADMINISTRATIONS.

The following statement gives the contributions made by Companies or other Administrations and expended on special works and the names of the said works:—

Circus	Object for which contribution was made.	Amount of contribu- tion.	Expendi-
		L.E.	E. 12.
2nd Circle	Cost of Mohit-Shamarka Canal Head, sluice and tail escape, contributed by Administra-		
	fion of Donains	340	340
	Remodelling Yusef Eff. Canal, contributed by Société Agricole	4(11)	4()()
3rd Circle	Maintaining Bridges on Mahmudia Canal, contributed by Municipality of Alexandria.	221	221
27 * *	Working Atf Pumps for the benefit of Kom El Akdar escape, contributed by the Com- pany		176
10	Contribution towards cost of Rosetta Rest House by Ministry of Interior	(31)	661
Delta Burrage -	Wardan Estate Company	5,600	4.631
9.9	Making a bank along the Bahr El Aanna, contributed by Ministry of Finance	838	838
	Total	7,035	6,666

Most of the items in the above list call for no remark. The Wardan Estate Company have obtained the concession of a large tract of low-lying desert land on the west of the Rayyah Behera on which it is proposed to start arboriculture. A flood canal to serve the estate, 6.4 kilometres in length, was made with a head sluice of three-metre vents.

Bahr El Aama bank.—At the request of the Ministry of Finance the right bank of the Bahr El Aama was moved forward on a length of 1.4 kilometres, so as to bring a large strip of sahel inside it, which will fetch a high price for building sites and gardens.

### CHAPITER V.

## MAINTENANCE AND REPAIRS.

The following statement shows the total expenditure under the head of maintenance and repairs:—

		EXPENDITURE.					
CIRCLE.	Regular Budget	Corvée abalition.	Sundry Receipts.	Total.			
lst Circle	33,233	46,000 42,000 26,350 7,650	251 792 1.339 1,132	87,016 76,023 48,440 25,348			
Totals	. 111,315	122,000	3,514	236,829			

The above expenditure was distributed as follows: -

HEAD OF ENPENDITURE	lat Circle	and Circle.	3rd Circle.	Delta Barrage.	l'otal.
Flood Protective Works Repairs of Structures and general Maintenance Maintaining Roads	E.E. 8,080 6,544 E.400	10,702 7,306 557	6,847 8,077 500	5,093 9,857	30,722 31,984 2,457
Maintenance of Canals and Drains  Totals	70,592	57.260	33,016	10,398 25,348	236,829

FLOOD PROTECTIVE WORKS.

The expenditure was distributed as follows:-

HEAD OF EXPENDITURE	lst. Circle.	Ind Circle.	3rd Circle.	Delta Barrage.	Total.
	L.E.	1K.	L.E.	(., E.	1 11-
Purchase of Stone and Building	5,591	10,501	6,487	4,520	27,099
Sundry Materials	_	70	:NA)	24.5	675
Earthwork	2,489	1,778	911	325	5,506
Totals	8,080	12,349	7,758	5,093	33,280
Deduct charged to Corvée Relief	_	1,647	911	-	2,558
Balance	8,080	10,702	6,817	5,093	30,722

The detail of the work done in the 1st and 3rd Circles and the Delta Barrage Directorate is as follows:—

CIBELE	New Spura	Spars required.	New Revelment	Revetment repaired.
	No.	NO.	Lev M .	1 M .
1st Circle	4	116	2,512	4.225
3rd Circle	14	88	832	1,688
Delta Barrage	2	28	5,412	2,338
Totals	20	232	8,736	8,251

The details for the 2nd Circle have not been supplied.

The cube of earthwork executed was 347,777 cubic metres. The expenditure was about the same as last year. What is required to make the river banks secure is the steady execution of retirements. A sum of at least L.E.30,000 per annum should be devoted to this work annually for some years in addition to the present annual expenditure of about L.E.30,000. The present allotments for Nile Defence Works only permit of maintaining the existing spurs and revenuents and small extensions of the same.

Retirements on the scale required cannot be faced. Needless to say this is the most urgently required work in the Delta seeing what the consequences of a breach in the banks would be.

#### GENERAL MAINTENANCE.

The most important works executed under this head were as follows:—

In the 2nd Circle. Stone work below canal regulators... L.E.1,000
In the 3rd Circle. Maintaining Abukir sea wall ... ... , 3,181
In Delta Barrage. Directorate. Maintenance of gardens. , 1,814
... Maintaining and working
Barrage ... ... , 6,867

The policy of using big blocks of stone for the repairs of Abukir sen wall has proved most successful and the condition of the work is now better than it has been for many years. In fact a large portion of the best consignment of stone is held in reserve, there being no necessity to use it at present.

## MAINTENANCE OF ROADS.

As often remarked before, the sum expended on roads maintenance is much too small. An expenditure of L.E.2,457 on the maintenance of 1840 kilometres of roads is ridiculous; about three times this amount would be the minimum with which one could even pretend to maintain the roads.

# MAINTENANCE OF CANALS AND DRAINS.

The following statement shows the cubes of earthwork by hand and the dredging executed in the maintenance of canals and drains during the year with the expenditure incurred:—

CIRCLE	EARTHWOR	K BY HAND	DREBGING		West		
CINCLE	Cube.	Payments in 1903.	Cuin	Payments in 1963.	elenrance,	Total.	
1st Circle	3,272,984 1,015,435	51,190 54,791 23,355 10,398	с.м. 680,045 28,411 278,232	17,148(*) 966 9,460	2.420 -	1.8, 70,767 55,757 32,815 10,398	
Totals	7,250,036	139,734	986,688	27,574	2,429	169,737	

<sup>(\*)</sup> A cube of 182,470 out of this was paid for in 1902. A large proportion of the cube of earthwork was done in remodelling canni bunks. In the lat Circle 65 kilometres of bunks were remodelled and the other circles were doing as much or more. The Inspector of the 2nd Circle states that several hundred kilometres of canni channols have been remodelled during the past few years.

The cube executed and expenditure incurred in maintenance of drains included in the above statement were as follows:—

Circle	EASTHWOR	EASTHWORK BY HAND		KIING	Word	
	Culs.	Cost.	Cabe.	Cost.	eleannee,	Total.
	C.M.	L.E.	C.M.	L.E.	Latt.	t.E.
1st Circle	77,811	5,910 1,420 1,390	14,7(N)	500 —	954 _	6,864 1,920 1,390
Totals	500,061	8,720	14,706	500	954	10,174

The above is a very small proportion of the total expenditure on earthwork. The Inspector of 2nd Circle explains that the early arrival of high levels in the canals put a stop to the work on drains which was in progress.

The following is the 5 years statement of dredging executed in maintenance of Canals and Drains.

Five years' statement of quantities of dredging done in maintenance:-

CANALS AND DRAINS.	1898-1899	1899-1900	1900-1901	1901-1002	1902-1903
	C.M.	4°, 50 .	C.M.	C.M.	C. M.
IST CIRCLE					
Isumilia Canul	322,471 125,557 152,854 51,112 2,823 22,648	225,096 77,462 195,960 62,561 70,197 15,081	190,790 83,647 926,635 84,622 32,115 21,487	182,006 101,668 240,157 70,886 34,818 14,624 29,001 5,410	342,776 72,976 107,306 64,906 —
Total	4177,7415	644,228	641,455	634,570	680,045°
Rayyah Menofin Qasid Canul Bain Tirah. Qoddaba Lock Baguria Head Kafr Rahen Lock Muhit Drain	300,037 74,810 10,630 —	255,583 138,204 5,950 5,512 4,124	112,567 	181,176 — — 4,014 5,966	13,708 — — — —
Total	(5),277	409,694	128,310	191,15n	28,411
3no Cincle. Rayyah Behara and Khaiatbah Canal Mahmadia Canal Nubaria Canal	185,082 128,434 87,980	184,316 117,530 17,848	149,915 159,921	82,200 142,027	114 H97 168,395
Total	347,396	971,889	\$09,889	224,293	278,232
Grand Totale	1,510,468	1,827,751	1,078,601	1,020,019	984,688
Expenditure L.E	-	-	-	-	27,874

Of this 192,470 was paid for provious to 1000.

In the 1st Circle the bed levels of the Ismailia, Sharkawia, Bassussia and Kumbatia Canals were raised 0.40, on account of the higher levels now maintained above the Delta Barrage. This accounts for the decrease in dredging in the last three channels. A large cube was done in the Ismailia and Suez Canals in the interests of navigation.

Dredging has almost ceased in the 2nd Circle, a fact which the Inspector ascribes to recasting of sections of canals, using regulators sparingly in flood, the spurring of canals, and the abolition of double sources of supply to wit: the Bir Shams Feeder to the Rayyah Menufia.

### CHAPTER VI.

# THE WADI TUMILAT ESTATE.

The progress made by this estate continues to be most satisfactory. The following statement shows the capital expenditure during the year, and compares the original estimate of capital expenditure required with the actual expenditure up to date:—

	0-1-1-1	EXPENDITURE.		
HEADS OF EXPENDITURE	Original Estimate.	During 1903.	Total to end of 1903.	
Drainage and Reclamation Works.	I.E.	L.E.	L. E.	
Enlargement of pumping station	6,000	-	4,279	
Enlargement of main drain	17,000	-	14,676	
Branch and field drains and field channels	15,189	290	8,215	
Remodelling Irrigation Systems.				
Wooden bridges and pipe heads	_	.50	_	
Purchase of Plant.	10,000	50	8,767	
Barge for pump dredger	_	119		
Staff and Farm Buildings.	2,500	119	3,024	
New Ezbehs	8,500	97	2,877	
Steam Ploughing, Staff and Sundries.				
Pay of staff, travelling allowance and sundries Ploughing.		368 108	-	
	3,000	476	3,461	
Totals L.E.	62,189	1,032	45,200	

The total capital expenditure during the year was L.E.1,032, and the capital expenditure up to the end of the year L.E.45,299. A small amount of drainage work still remains to be done on the west of the Ismailia Canal; this cannot be carried out till the old Saidia Head under the Ismailia Railway has been converted into a syphon.

It will not be necessary to borrow any more money for the completion of the works since, as will be shown below, the surplus of revenue over expenditure is considerable.

#### REVENUE ACCOUNT.

The receipts and the expenditure during the year are as follows:-

Receipts:—		
		L.E.
Balance brought forward from 1902	• • •	1,708
Rent of land (16,922) feddans	0 0 0	27,514
" " Palm trees	4 9 9	406
" " Water mills		152
" " Incubator	0.00	20
Grazing and Wild Samar		185
Sundries	0.00	168
Total		L.E.30,153
Expanditure:-		
		L.E.
Staff	0 + 0	2,340
Kassassim pumps		3,684
Payment to Public Instruction	* * *	8,000
Taxes	201	5,875
Maintenance of canals and drains	0.00	1,675
Petty expenses and travelling allowances	* * *	193
Measures for prevention of cattle plague		20
Total		L.E.21,796
Surplus	100	L.E.8,357

Deducting the balance carried forward, the net profit on the year's working was L.E.6,649.

## COMPARISON OF ESTIMATED AND ACTUAL RECEIPTS.

The following statement compares the estimated and actual receipts:-

YEAR OF NEW	MANAGEMENT.	Expenditure.	Recaipta.	Surplus.	Deficit.
		L.E.	L.E.	L.E.	L.K.
	1st	10.000	15,710	_	3,640
Original forecast	\ 2nd 3rd	111 950	17,200 19,700	350	2,150
CLAMMAN TOLCCHOL	/ 4tn	2.63.53.7743	35,2(X)	3,150	
	(5th	Title Shifteen	23,750	4,4(10)	_
	1899		16,025	198	_
Actual results	1900		19,957	314	
Actual results	1901		21.138	720	
	1902	91 706	22,744	1,593	
	, Tana	21.770	28,445	6,649	_

Hence it appears that the net surplus on the five years of working is L.E.9,474 against the estimate of L.E.2,110.

The growth of expenditure is due to increase of area and consequent increase in the maintenance of irrigation and drainage channels.

The area rented during 1903 was 16,922 feddans. The forecast for the year was 12,000 feddans. Hence it appears that the estate is developing at a satisfactory rate. Of the 16,922 feddans rented there remain 2,655 feddans still uncultivated.

#### CROPS.

The areas under the various crops were as follows:-

										Feddans.	
Cotton.	0 0 0		***							4.731	
Maise				100						3,580	
Rice	000		***		0 3 m		0.04			2,182	
Samar Sesame	000	4 4 4	9.0-0	* * *		***	***			3.100	
Ground no	14 =		8.0.1	* * *	4 0 0	***			F = 0	310	
Vegetables	ALF		P 0 a	==+	0 + 0		5 4 4		2.0.0	224	
1 cg campe	****	444	***			9 60 6	P = 0	0.00		.i()	1.1.3.20
Uncultivat	1										14,267
Unicantityaa	MHU	= 0 0	4 8 0	1.000		* * *	* * *	* * *			2,655
											1/2 (3434)
											16,922

The rent collected works out to about 30 % of the value of the crops.

# KASSASSIN PUMPING STATION.

Tables have now been made out by Mr. Brooke for calculating the discharge of the pumps from the revolutions and lift.

The following statement gives details of the working of the Station for the last three years:—

=		1	Quantity	Consumpti	ON & COS	BT OF COAL			
Aren rented fedd.		Quantity pumped	pumped per feddan,	Cont	Cost of Cont	Cont consumed per million c.m. lifted.	Lift.	Expanditure for the year.	
				Tons.	1_K.	Tone.	Metre.	L. W.	
1901	12,367	60,660,000	4.917	1,753	3,099	20	2.65 to 3.60	3,961	
1902	15,200	76,550,000	5,036	2,001	3,240	26	255 to 301	4,234	
1903	16,922	89,548,000	5,292	2,099	2,994	233	2.45 to 2.77	3,684	

Mr. Langley explains the increase of cube pumped per feddan as being due to the increase in area of land under reclamation consuming large quantities of water, as compared with old cultivated land consuming much less water. The satisfactory reduction in the consumption of coal is doubtless due to the reduction in lift consequent on the improvement in the outfall drain.

After being warded off for a long time by strict precautions the cattle plague finally appeared on the estate, and up to the end of February had carried off 410 head of cattle. All possible precautions are being taken.

The following is the estimate of receipts and expenditure for 1904:-

Recripts:—  Rent of land (17,000 feddans) 30,000	
Rept of land (17 000 foddans)	
, Palm trees	
" Water mills 150	
Incubator 20	
Wild Samar 100	
Sundries 130	)
L.E. 30,800	?
Expenderure.	
I.E.	
Staff 2,84	1
3.80	0
5 011	
8-83-257-117 + 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	
T IN STREET OF T CONSTITUTION OF COLUMN AND ADDRESS OF THE PARTY AND AD	
THE PERSON AND THE PE	
Petry expenses	-
22,75	7
Estimated Surplus 8.04	
	-
L.E. 30,80	U

Mr. Langley and Moussa Bey Ghalib are to be congratulated on a successful year's working.

## CONCLUSION.

#### STAFF.

Sir Hanbury Brown retired from the post of Inspector General, Lower Egypt, on 10th April and was succeeded by me.

The circles were held as before. Mr. Tottenham acted as Inspector of the 2nd Circle for a considerable portion of the year, while Mr. Dupuis was absent on missions and leave.

Mr. Molesworth, Director of Works, was transferred from the 1st to 2nd Circle in December.

Mr. Hurley replaced Mr. Molesworth, his mission as Resident Engineer on Zifta Barrage having terminated on completion of the work.

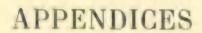
Mr. Roberts joined the 2nd Circle as Surveyor of Contracts.

Mr. Grieve, Surveyor of Contracts, resigned. Omar Bey Abdel Barr and Ali Eff. Showki, Chief Engineers, retired.

Mohamed Bey Choukri and Ahmed Bey Helmi, Chief Engineers of Menufia and East Gharbia, died. Mohamed Eff. Zohdi replaced Ahmed Bey Helmi deceased in East Gharbia. Mohamed Eff. Zahed was transferred from Dakahlia to Menufia, to replace Mohamed Bey Choukri deceased, and was replaced in Dakahlia by Mahmoud Eff. Fahmi.

# K. E. VERSCHOYLE.

Inspector General of Irrigation in Lower Egypt.





# APPENDIX A.

Abstract of Accounts, 1903-Irrigation Department, Lower Egypt.

REQUIAB HEAD.	let Circle.	2nd Circle.	3rd Circle.	Barrage.	Zifta Barrage.	Totals.
Establishment.	LE. M.	L.E. M.	Lo.R. M.	L.R. W.	L.E. M.	L.R. M.
Classified staff	9,434.414	8,654,981	7,053.258	2,819,250	-	27,961.903
Unclassified staff	4,399,473	4,130.937	2,877.583	3,686,935	-	15,094.928
Travelling charges	2,983,813 251,789	3,241.313	2,654.012 130,997	814.940 67.000	_	9,694,078 755,191
Dalabiyas and rent of offices	362.081	305,405	200,000	125.000	_	687.081
Office charges and furniture	315.249	215,321	60,000	19,844		610.414
Total	17,746.819	16,547,957	12,975.850	7,532.969		54,803,595
Works.				0 11 7 7 7 7 11 11	5 4 4 () (N/N)	99 979 WW
Irrigation improvements Drainage works	6,463,000 4,258,000	A	3,013.000	2,928,000	1,449,000	33,372.000 7,518.000
Flood protection	8,080,000		6,847,000	5,093,000	_	30,722,000
Maintenance and repairs of struc-				3 = 0 × 0 0 0		an dot man
tures and sundry expenditure Repairs of roads	6,519,000 1,400,000		6,739,000 500,000	8,725,000		28,697.000 2,457.000
Pumping stations	_		14,367,000	_	_	14,367.000
Maintenance of canals and drains	24,767.107	15,261.791	6,664.541	2,747.942		49,441.381
Totals, and Regular Budget	69,233.926	71,101,748	52,566,391	27,026.911	1,449,000	221,377.976
OTHER CREDITS.						
Corvée abolition	45,999,990		26,349.872	7,649.999		121,999,122
Agricultural roads	140 000	12,749.747	1,619,857	-	-	12,749.747 1,719.857
Contribution by other adminis-	100,000	_	1,05,610,1		_	In the Court
trations	_	740,000	236.130	5,469.174		6,445.304
Sundry receipts	251.024	791,840	1,339.074	1,131.490	1,111,000	4,624.428
SPECIAL GRANTS BY CAISSE FROM GENERAL RESERVE.						
Irrigation improvements	17,713,738	16,027,316	11,479.075	9,818,462	_	55,038,591
Drainage works	21,553,951	24,932.000		-		72,117,380
Special Low Flood Credit	278.922	343,426 369,111	4,836.621 203.568	747.224	_	5,458,969 1,319,903
Mehallet El Amir dam	1	0,5050,02.8.8	7,870,781		_	7,870.781
Damietta sadd (arrears)	366.485			0.00		366,485
Zifta Barrage subsidiary works.	_	-	_	-	84,587,819 2,682,559	84,587.819 2,682,559
Subsidiary works 1st Circle	14,011,260	=	_	****		14,011.260
Ezbet el Borg Reservoir	2,459.744			_	_	2,459.744
Totals other credits	102,735.114	97,952,701	79,566.407	24,816,349	88,381,378	393,451.949
Grand Totals	171.969.040	169.054.449	132 132 708	51 843 960	89.830.378	614,829,925
	100000000	2300007233507	and State of the Control of the Cont	10.0 dr. 20.000(1)/		

# APPENDIX B.

LIST OF NEW AND REMODELLED IRRIGATION CHANNELS EXECUTED UNDER THE HEAD OF SPECIAL WORKS.

NAME OF	CHANNEL		New Channels,	Remodelled Channel
1st C	inala		Kilometres.	Kilometres.
Ghazali Canal		***	9 ° 0 6 ° 0 4 ° 0	4.0
	Total		1:0.()	4.0
Nagail Canal	Total		3.0 2.0 6.0 2.7 0.0	48.0 6.0 1.0 0.0 0.0 4.0
Baslaqun Canal	4 020 100 000	*** ***	= 0.0	13.0 2.0
Khashah Canal	zeh	*** ***	2·8 0·0 2·8	2.7 10·8 13·5
	Grand Total		35.5	91.5

# APPENDIX C.

LIST OF NEW AND REMODELLED DRAINS EXECUTED UNDER THE HEAD OF SPECIAL WORKS.

NAME OF DRAIN.	New Channels.	Remodelled Channel.	Bewarks.
	Kilometres.	Kikanetras.	
1st Circle.			
Bahr El Bagr	_	7·() 1·5	
Mit El Amal Masama Timsah	6.2	2.0	7 bridges, 12 pipes aqueducts. 2 syphons, 22 pipes, 17 bridges.
Total	6.2	10.5	
2nd Circle.			
Batra	-	25.0	) 10 new bridges.
Samatay Dahria	_	18·0 15·0	15 pipe aqueducts.
Abshan	_	10.0	7 bridges modified.
Wazaria	_	6.0	i mages mounted.
Qebrit and Fua Orban	4.0	9.0	
Total	4.()	83.0	
Srd Circle.			
Lman	_	47 #43	977 1 1
Damanhour	_	6*0 5*0	35 bridges made. 51 pipe aqueducts.
Nediba	_	10.2	8 syphons.
Nubaria Delingat	1.2	4.8	5 pipe inlets.
Khaim	12·4 5·4	_	
Rozafa	4.1	_	
Kafr Melit	11.0	_	
Mehallet Bishr	3.0	-	
Total	37.1	26.0	
Grand Total	47.6	119*50	

#### APPENDIX D.

List of Canals subjected to the special programme for rice cultivation.

#### 1st CIROLE.

#### DAKAHLIA PROVINCE.

Buhia Canal and branches from Barhamtoush new Regulator to tail.
Gabbada Canal and branches, Bahr Tanah and branches.
Buhr Saghir and branches from Railway bridge at Dekernes to its tail.
Sharkawist Faraskour and branches from Badaway Regulator to tail.
Om Salama and branches from Mit El Amil to tail.

#### SHARKIA PROVINCE.

Saidia Canal and branches, Saarana and branches. Samaana and branches.

Bahr Facous and branches from Demiyeen canal head, to tail.

Sadi and branches from railway to tail.

Bahr Moes and branches from Safra Regulator North.

Hanout Canal and branches from Boussa Regulator including Hagarsa Canal.

Shebini Canal branches from Zawamel junction including Mit Yazid East and branches.

#### 2nd CIRCLE.

Qoddaba Canal and branches from Badalet El Saidi to tail, this includes the Yusef Eff. Canal, Rashidia Canal and Khalig Berimbal.

Buhr Saidi and branches from head to tail.

Lusefar Canal and branches from head to tail.

Ghonemi Canal from its bifurcation at Aguzen, northwards, this includes the Shaba and Etbu Canals.

Saftay Canal and branches from Kafr Gedid Regulator to mil.

Rowena Canal and branches from Hamra Regulator to tail.

Quaid Canal and branches from Khomar Lock to tail including the Kom El Wahal Canal.

Bahr Mallah and branches from Tombara Lock to tail including the E. and W. Gannabias Tombara.

Bahr Tira and branches from the Abshan Lock to tail including the Abshan Canal and Gannabias, Sharkawia and Nozam.

Rayyah Belgas and branches from the Barari Railway to tail; this includes the Surama, Hafiz Shihab el din, Bahr Maasara, Banawan, and Bishma Canals.

Buhr Shehin and branches from the Barari Railway to tail, this includes Ramly, Fuzil, Samar and Hag Sherbin canals,

Sahel Canal and branches from the Barari Railway to tail; this includes the Bahr Hesas and Tell Canals.

Sherbin Canal and branches from head to tail.

#### 3rd UIRCLE.

#### BEHERA PROVINCE.

The whole of the Mahmoudia System and Branches.
The following branch canals of South Beheva Division:
El Abadia Canal.
Safasif Canal.
Um el Hanash Canal.
Kafr Beni Hilal.
Dessonnes and (private) Um dinar Canal.
Kafr Mousaed Canal.
Kala Canal.
Bahr El Akar Canal, and its branches.
Yaden and Akaline, and the Shakir Canal.

#### APPENDIX F.

# Note of Mr. Molesworth on Abu Zaabal syphon.

As will be seen from the drawings, this is a pipe syphon composed of 1 mild steel plates. The length of the pipe is 85 metres and the diameter 1.50 metre.

Owing to the conditions of the locality and the impossibility of drying the Ismailia Canal, it was necessary to place the pipe in position without resorting to

the usual practice of diverting the canal.

The method of placing the pipe was by means of dredging a trench to the required depth accross the canal, floating the pipe into position, piercing the water-tight doors and sinking into place. The canal banks were then remade over the pipe ends and operations for getting in the necessary pitching and stonework to protect the ends of the pipe and hold up the banks begun.

The pipe was sunk in February 1902, and all efforts to excavate and get in the pitching by ordinary means failed; in spite of repeated attempts, the springs proving too strong and the nature of the soil at site being such as to render the

excavation in such a limited area well nigh impossible.

In August 1902 all attempts to get in the pitching by ordinary excavation were abandoned, and it was decided to sink masonry wells at either end of the pipe and, by boring through the walls of these, it was proposed to establish a through communication. These wells were of brickwork in cement up to a reduced level of 10 000 and, in order to drown out the springs, had to be carried up another three metres in temporary masonry before they could be plugged with grout.

The operations of sinking and grouting were successfully carried out and it only remained to dry the wells and bore through into the pipe. But, on account of the wells not having sunk exactly flush with the pipe ends, spaces were left between these and the backs of the masonry wells. The spaces were as much as 13cms, on the upstream and 19cms, on the downstream side. Directly holes were pierced through the walls springs started, carrying back through the newly bored holes such quantities of sand and water as to preclude the possibility of enlarging the apertures to the same diameter as that of the pipe.

Various attempts to cut these holes both by divers and other means were

made but proved abortive.

In April 1903 it was decided to abandon the idea of getting at the pipe ends in "the dry" and by use of divers, and to resort to the method of grouting. For this purpose, all materials, such as stones, piles, etc., which had been used in the former operations were cleared away from the neighbourhood of the wells, and sand pumps were erected in order to dredge out inverted cones at the backs of the wells with their apices half a metre below the ends of the pipe on the underside. A certain cube was accomplished by this means, but owing to the gravelly nature of the sand, the laborious process of excavating the remainder by

means of divers had to be reverted to. However, the excavation was at length accomplished and everything was got ready for grouting.

To guard against a leakage of cement into the pipe, strong circular wooden doors as shown in Plan III were lowered by divers and tightly wedged up against the pipe ends by means of wooden wedges against the well walls.

A gront tight joint was made between the pipe flunge and the wooden door by nailing tarred canvas on the door as a fitting strip where the pipe flunge would

abut.

The holes already broken through the well walls were stuffed with sacking and the wells themselves filled with sand up to a level one metre above the top

of the pipe.

Divers then scrubbed the face of the masonry all round the pipe lip where the grout would form a joint against the well. This was done with foundry brushes the bristles of which were shortened to render them stiffer. On all the dirt and slime being cleaned off rubble stone was lowered and packed round the grout pipes which had been placed on each side of the end of the syphon pipe. The rubble stone was built to a level equal of one third the way up the vertical diameter of the syphon pipe, thus filling up the lower part of the dredged cone. This layer was then grouted up, the cement used being "Casale Monferrato" and a solid block of masonry was obtained under the end of the pipe syphon and against the wall back.

In order to economise grout, wooden boxes were constructed so as to overlap the well sides and saddle over the pipe, their position will be better understood from the drawing. They were fixed by iron tie bolts which, on being screwed up, gripped the overlapping ends of the boxes against the well walls. After the first layer of grout had been cleaned these boxes were filled with rubble stone by the divers to a height of half a metre above the large pipe. On this being done, the boxes were covered with sacking and a talus of sand was formed round the sides of the box by passing the sand through a pipe manipulated as a shute from above. This was done to prevent leakage of cement under and through the boxes.

The boxes were then grouted up through the same pipes as were used for the

lower layer.

The masonry blocks thus formed were allowed two days in which to set and the wells were then unwatered cleared of sand, and the sacking removed from the holes in the well walls.

Everything was found to be quite watertight and the enlarging of the holes to the same diameter as the inside of the syphon pipe was proceeded with.

This was accomplished and the wooded doors cut through and a perfectly watertight joint was found to exist round the pipe end and against the well back.

Thus for an outlay comparatively small, as compared with the expense incurred in the endeavours to complete the syphon by other means, the work was successfully finished.

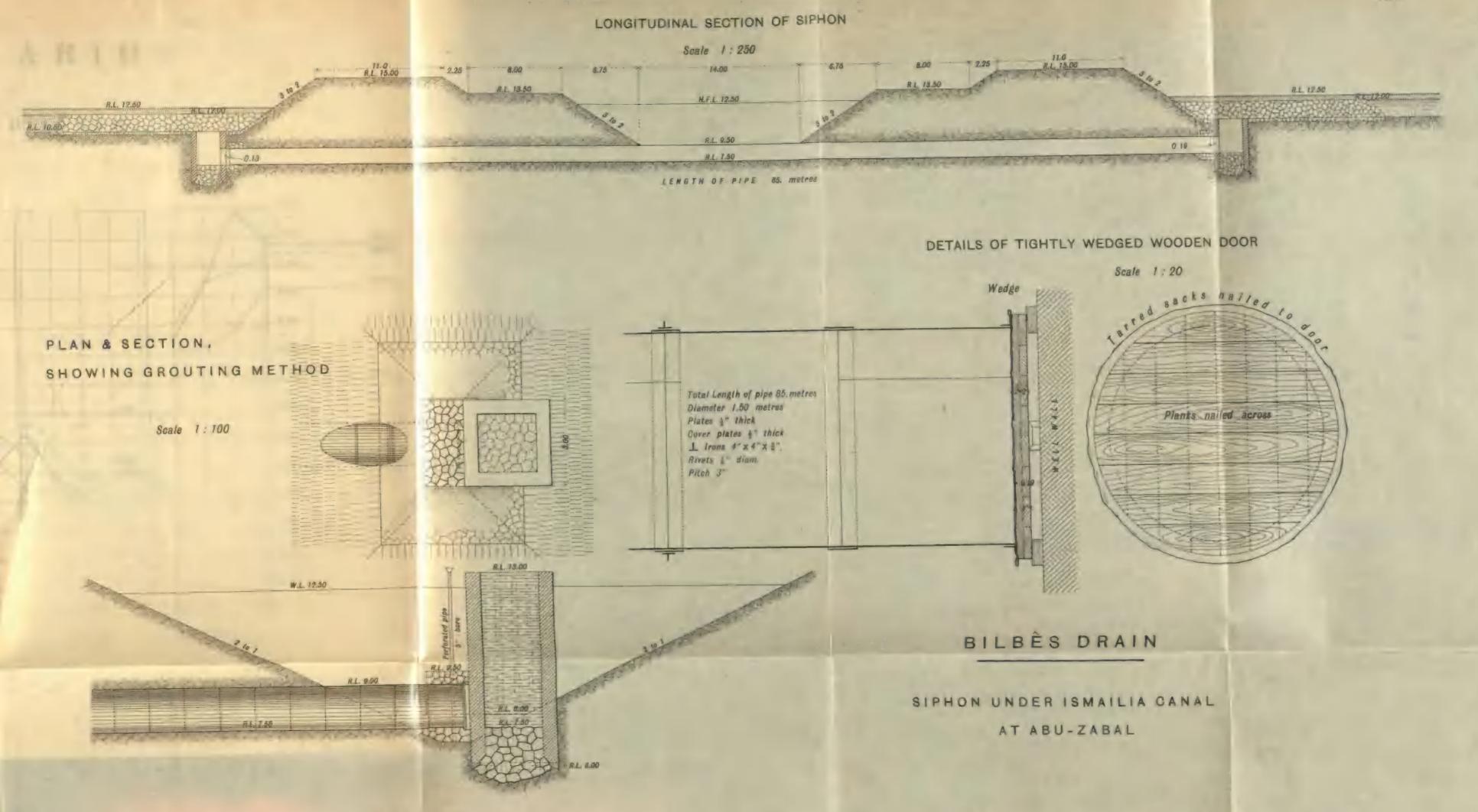
STATEMENT SHOWING THE AREA UNDER DIFFERENT CROPS IN THE PROVINCES, LOWER AND DOMAINS, FROM THE COMMENCEMENT

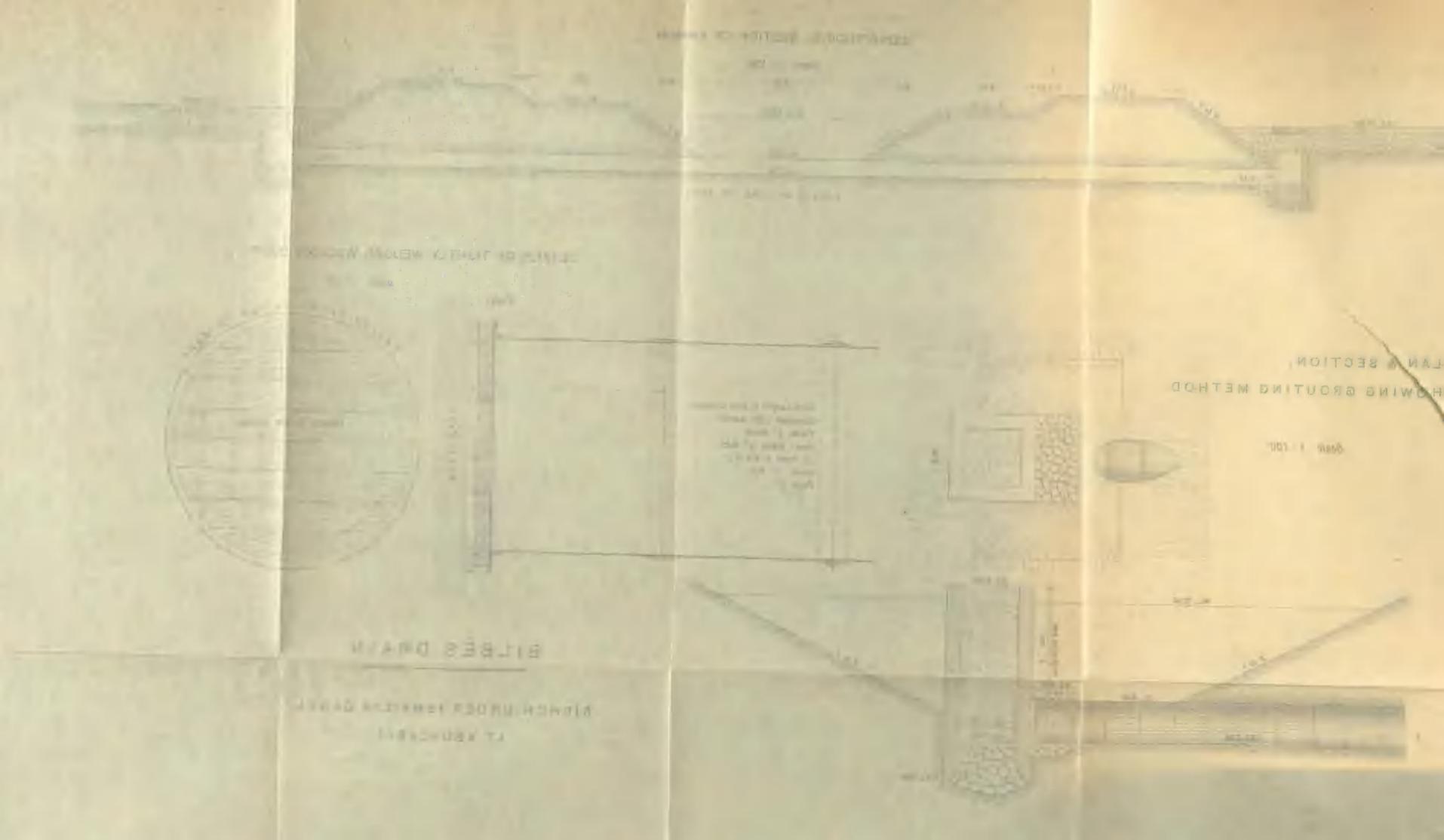
• EGYPT, INCLUDING GOVERNMENT AND WARF'S LAND, AND LAND OF THE DAIRA SANIKE OF THE FLOOD OF 1902 TO THAT OF 1903.

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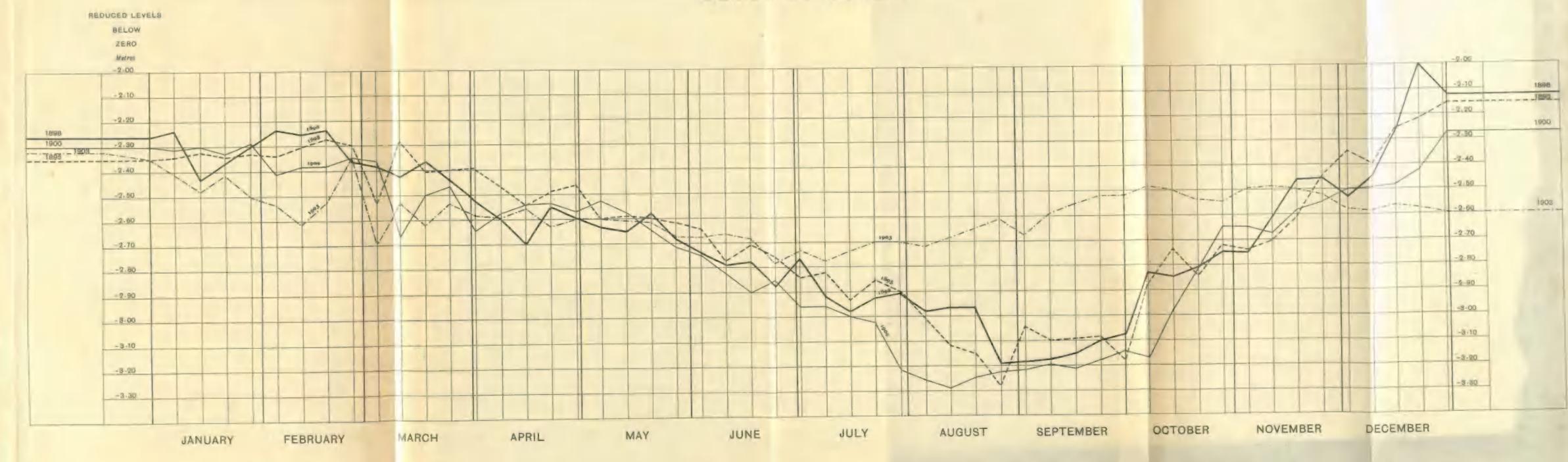


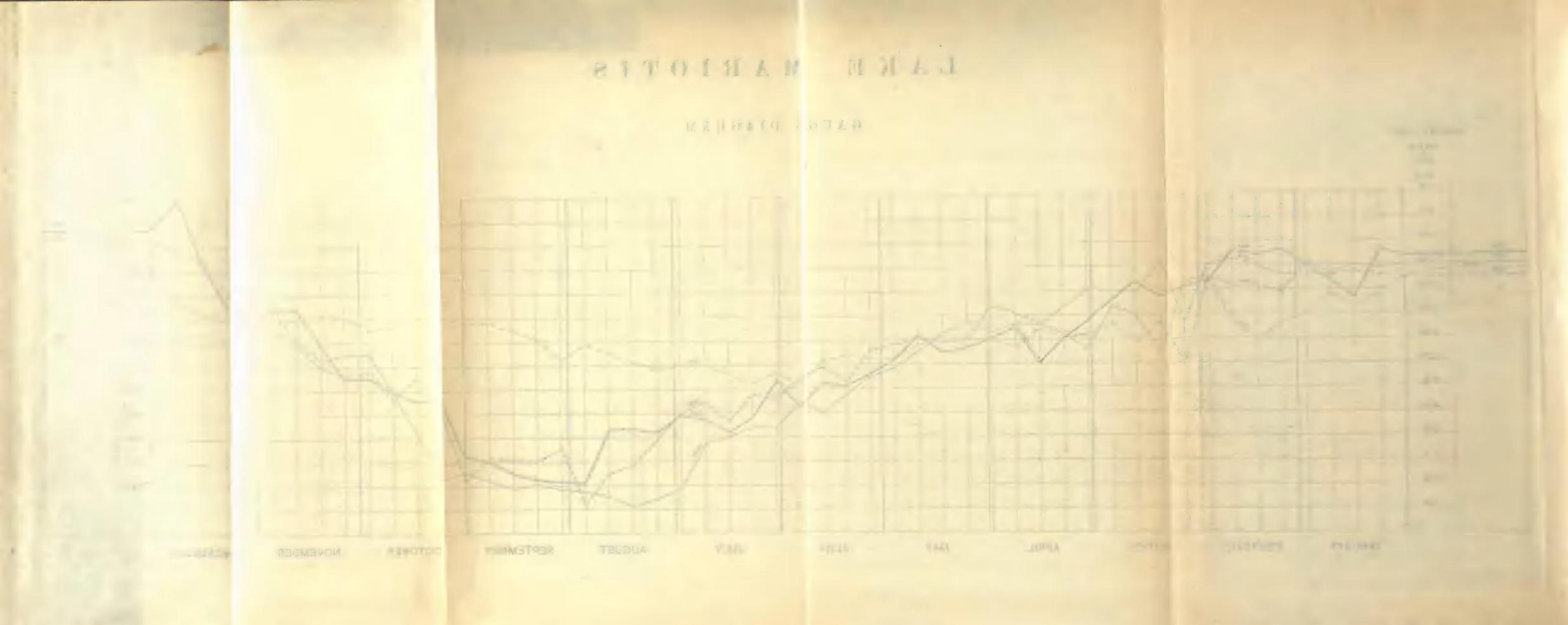




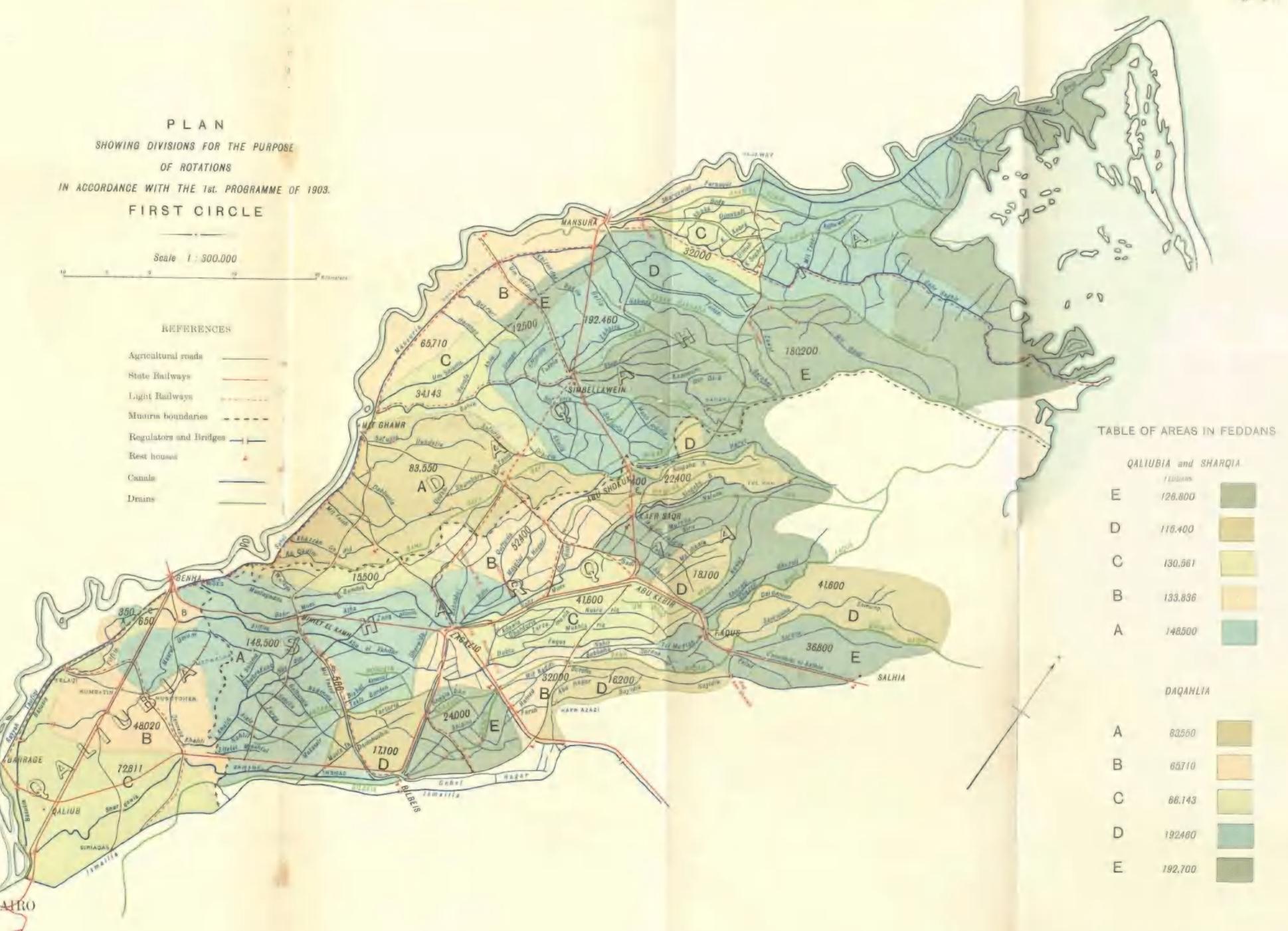
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GAUGE DIAGRAM





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# REPORT ON THE TANZIM DEPARTMENT.

1903

BY

A. H. PERRY.



# REPORT ON THE TANZIM DEPARTMENT, 1903.

Cairo, May 30th, 1904.

TO THE UNDER SECRETARY OF STATE,
PUBLIC WORKS DEPARTMENT.

SIR,

In accordance with your instructions, I have the honour to submit my yearly report on the Tanzim Department after revising and abridging the part referring to new works and repairs.

The following Officers are specially commended:—

('hiej Inspectors.—Messrs, Hewat and Clifton.

SPECIAL WORKS' OFFICE :-

Inspector.—Mr. Pastour.

Director of Works.—Mr. A. De Cosson.

Chief Engineer.—Mr. Watson.

Special Inspection East.—Mr. Richmond.
North Inspection.—Mr. Schauffele.
East Inspection.—Mr. Chapman.
West Inspection.—Mr. Ehrlich.
Cairo Voirie and Tanzim.—Mr. Reboul.
Waterworks, Nurserises, West Roads' Circle.—Mr. Curtis.
Gas, Cart Service and Stores.—Mr. Fitz-Patrick.
Accounts Office.—Yussef Eff. Habib.

I have the honour to be, Sir, Your obedient servant,

A. H. PERRY,

Director General of Towns and State Buildings.



#### GENERAL

#### NEW WORKS

The total sum spent on new works completed or in course of construction during 1903 amount to:

Upper Egypt ... ... 21,964
Lower Egypt ... ... Total... L.E.80,838

Appendices
Nos. 1 and 2.

#### LOWER EGYPT

# WORKS TAKEN OVER FINALLY IN 1903.

The Arab Museum and Khedivial Library was finally taken over in September last; the Museum was opened to the public on the 28th of December. The removal of the books to the Library is in progress.

The interior painting of the Library was postponed until after the arrival of the steel book-cases from Europe. It is now finished.

The exterior of the building has recently been cleaned, several additions have been made and others are still in progress.

The imitation marble balustrade for the Library staircase has not proved a success and will, I hope, be replaced by one of real marble before long. The cost of this failure is borne by the contractor.

# WORKS COMPLETED DURING 1903 OR STILL UNDER CONSTRUCTION.

# Egyptian Museum.

# (1) Residence of the Secretary General.

Besides a dwelling house containing 9 rooms for the Secretary General this building contains 4 rooms used as offices for the Director General of the Museum and for the clerical staff.

It has been occupied since September last.

## (2) Workshops and Sheds.

These buildings are of a very simple character. They consist of stores and repair shops for the excavating plant of the Museum Direction, and cabinet makers and model makers' shops.

They were handed over last January.

# (3) Boab's Lodge, Boundary Wall and Latrines.

These were completed at the same time as the workshops. The handsome railings forming the southern boundary were transferred from Gizeh Museum.

# (4) Changing Roofs of Skylights.

The Museum skylights as originally designed were of two distinct types: the 1st being entirely of glass with sloping roofs; the 2nd having sides only of glass with flat ferro-concrete coverings.

The former were considered by M. Maspéro to be objectionable, owing to the risk of accident in case of the glass breaking and also on account of the excessive amount of light admitted. It was further found impossible to keep such large glass roofs absolutely water tight. They have, therefore, been altered and are now exactly similar to the 2nd type. The work was begun after the tourist season and is now finished.

# (5) Mariette Pasha's Monument.

The monument erected in honour of Mariette Pasha stands in front of the Egyptian Museum to the west of the principal entrance.

The plan is based on that of the exedrae of the ancient academies. Upon the central axis is placed the granite sarcophagus of Mariette Pasha, behind this stands his statue-raised upon a pedestal which is flanked on either side by a colonnade of square pillars arranged on the usual apsidal plan and surmounted, by a cornice. This colonnade is built of marble taken from the grand staircase of Ismail Pasha's Palace at Giza and forms a backing to seats facing the sarcophagus. The statue, which is 3 metres in height, is of bronze and represents Mariette Pasha standing with folded arms in front of a broken block of granite; he holds a plan of the Museum in his right hand.

The pedestal and statue are respectively the work of M. Edouard Mariette and M. Denys Puech of Paris. M. Prampolini, of the Public Works Department, designed the remainder of the monument.

The work was begun in February 1903 and completed in February 1904. It was carried out by M. Camillo Beato for the sum of L.E. 990.

## (6) Khedivial Library, book and exhibition cases.

The contract for the supply of these was given to Mr. Panzer of Berlin,

There are 24 book eases of various sizes, capable of holding 51,000 volumes, and 27 glazed exhibition cases which will contain the more valuable manuscripts.

Both book and manuscript cases are made entirely of steel and glass and are absolutely dust proof.

The cases are now being erected by a staff of fitters sent specially from Germany, and should be finished early in March.

The cost of the installation will be L.E.7,000 or L.E.1,000 less than the estimate.

## (7) Arab Museum supplementary works.

A pavement of cement tiles has been laid round the entire building with a garden surrounded by iron railings at the south end. Railings have also been erected along the east façade and round the entrance to the basement to prevent passers by from disfiguring the walls.

Numerous improvements, such as partitions and extra doors have been added to the interior of both the Museum and Library.

It has recently been decided to provide both the main entrances with lobbies and swing doors. These will shortly be ordered and will, I hope, be the last of the items required to complete the building.

## B.—Interior.

# (1) Port Said Governorate completion.

This building was taken over provisionally last February.

The Government offices are on the ground floor, the upper storey being the residence of the Governor General.

# (2) Kom Hamada Police Barracks.

This markaz is the last of the old type.

The contractors, Messrs. Boyer and Parizot, were considerably handicapped throughout by the difficulty of getting materials to Kom Hamada and the slowness and expense of railway transport.

The building was finished last July and has been occupied since

that date.

## (3) Belbeis Police Barracks.

This building was completed in December. It is of the new type of markaz.

The contract was well and accurately carried out, and reflects great credit on the contractor, Ali Badawi.

I have previously drawn attention to the excellent work of this our only native contractor. The business-like methods which he uses in dealing with his contracts and in organising the work generally, might with advantage be imitated by many of the European firms with whom we have to deal.

A boring has been made in the yard of this markaz and water found at RL + 5.40 (4 metres below the surface). This water, though organically pure, was found to contain a large quantity of salt, and the boring was therefore continued to RL—4.60. No more water was found however, the ground between RL + 5.40 and RL—4.60 being stiff clay.

The water at RL - 5.40 is now being pumped and is apparently fit

for horses to drink.

## (4) Tanta Police Barracks.

This building was begun last May by Mr. Tréhaki. It is similar to the Belbeis Markaz, but has 3 rooms only on the 1st floor for the Inspectors of Finance and Interior, as accommodation for the Mudir and for the irrigation officials already exists at Tanta.

The work should be finished in June.

## (5) Cairo Central Fire Brigade Station and Police Barracks.

This building is now nearing completion. Besides the fire station and barracks for 128 police, there is a hospital to contain 20 beds and quarters for the Commandant of Police and the Principal Fire Brigade Officers.

The ferro-concrete foundations were described last year, and I will now confine myself to giving an outline of the work since their completion.

The elevation masonry, for which Mr. Garozzo is the contractor, was begun in November 1902 and was, with exception of the tower, finished

last October.

The floors and roofs, which are in the Hennebique system of ferroconcrete, were also completed by that date. Some of these floors did not fulfil the specified conditions when tested under 1½ times their calculated load and were consequently refused and demolished. All these are now remade and the second tests have in every case been satisfactory.

Bad centring, by allowing the concrete to sag before it has properly set, frequently ruins a floor when the materials and workmanship are otherwise good.

The plastering, joinery, staircases and sanitary work were begun as soon as the masonry was finished and are now well advanced.

The exterior of the building is plastered with hydraulic lime and sand, while for the inside work ordinary lime and sand are being used.

The fire engine and fire escape house and stables are paved with Staffordshire blue bricks ordered from England for the purpose. The engine house is also fitted with patent quick opening doors, the fittings for which were supplied by Messrs. Shand and Mason; steel sliding poles ordered from the same firm provide a means of quick descent from the firemens' quarters to the ground floor.

Recently the progress of the work has been somewhat retarded by a slight settlement of the foundations caused by the considerable difference between the weights of the tower and building proper. The building of the tower was suspended and the ferro-concrete foundations stiffened by lateral ribs arranged so as to spread the weight of the tower over a much larger area than before, and thus minimise the inequality of the loading on the soil under the foundations.

After allowing sufficient time for the new ribs to set, the masonry of the tower was continued and is now nearly finished.

This work is an example of the adaptability of the ferro concrete system of construction, this method of stiffening being more easily executed than ordinary underpinning.

In spite of this delay, the work will, I hope, be finished by the end of March, only one month after contract date.

The design, which has been much admired, is by Manescalco Bey.

#### Zagazig Mudiria.

In the year 1902 it was decided to reconstruct the Mudiria buildings. The condition of the existing buildings, in spite of the fact that they were only 20 years old, was, generally speaking, so bad as to render any attempts at effective reparation useless. A large proportion of the building was in a dangerous state. The drawings and other documents for the new Mudiria were prepared under the supervision of Mr. Clifton. The examination of the tenders and the subsequent superintendence of the construction was entrusted to Mr. Richmond.

Tenders.—No tender was regular in all respects and no tenderer had completely informed himself of the conditions he pledged himself to fulfil. The tender presented by MM. Koressios and Allam, amounting to L.E.35,000, was accepted as being the lowest and the most regular.

Site.—It was necessary to arrange the site in such a manner as to prevent the work of reconstruction interfering with the occupation of those existing buildings which were still in a stable condition and which were needed for carrying on the business of the Mudiria. The site was, therefore, divided into two parts. One of these is destined for the accommodation of the new Tribunal and Markaz. When these buildings are completed the Mudiria staff will be moved into them, the remainder of the site will then be free for the reconstruction of the buildings for the Ministries of Finance and Interior and for the Summary Tribunals. On the completion of the whole a redistribution of the staff into their proper buildings will take place.

The demolition of the buildings upon that half of the site taken over by the contractor began on September 9th. The remainder of the year was spent in carrying on demolitions and in preparing the foundations of the new Tribunals. Materials sufficient for a year's work were brought to and stacked upon the site.

# U.—Justice.

## (1) Mansourah Summary Tribunal.

The commencement of this building was delayed owing to difficulties in connection with the purchase of the site. These have now been disposed of and work was started in December. The court is placed on part of the site of the old Mansourah Shouna where the new Mudirich and the Mahkama Sharia will also be built.

Before these are begun, however, accommodation will have to be found for the Irrigation Stores at present on the site.

## (2) Cairo Mixed Tribunal additions.

This contract, which was undertaken by Messrs. Padova, Léon Rolin & Co., is divided into two parts.

- (a) The Annexes to the east of the main building which consist of a Summary Court room, a room for the archives, and the offices.
- (b) Upper Storeys on the two wings of the existing Mortgage Office.

Both buildings are of a simple character and require no detailed description.

The Mortgage Offices are already finished, while the Annexes are well advanced and should be ready for handing over on the expiration of the contract in March.

Patent rolling shutters have been fitted to the Archives Office, as the height of these windows above floor level is such that it would be incovenient to open and shut the ordinary type of shutter.

At the suggestion of the contractors the locally manufactured "Massarah" cement was tried for one of the ferro concrete floors of the annexes. This floor, when tested under 1½ time the specified load, proved so satisfactory that the contractor was authorized to use Massarah cement for the ferro concrete roofs of the building, on condition that each roof was tested. The results of these tests were in every case excellent.

## //.-Posts.

## (1) Port Said Post Office.

This building was completed and handed over to the Posts Administration last April.

During the progress of the work it was decided to suppress a portion of the upper storey, as the building originally designed contained more accommodation than was required.

#### E. -Education.

# (1) Cairo School of Law.

This building was completed last October. Accommodation for 200 pupils is provided with a large lecture room, a library, administration block and quarters for the principal.

The foundations and most of the elevation masonry were finished in 1902, and during the past year, the work has consisted chiefly of plastering, joinery, floors, staircases, etc.

The building is fitted with electric light.

This design, which has found much favour, is also one of Manescalco Bey's.

## (2) Shibin El Kom School.

This school was finished in April 1903. Accommodation for 150 pupils is provided in the main building which consists of a central block and two wings. There is also a large dining hall and kitchen.

A prayer room and a house for the Public Instruction inspectors are still required, but no funds are at present available for these.

# (3) Sanich School.

This is the largest of the buildings at present under construction.

The ferro concrete foundations, which were described last year, were completed in October 1902, and since that date the progress of the work has been steady, though at times somewhat slow. The masonry, floors and roof are completely finished, and plastering and joiners work are well advanced, while a start has been made with the wooden verandal round 3 sides of the building.

Unless some unforeseen delay occurs the work should be ready to be handed over by 13th of June next when the contract period expires.

Since the commencement of the building a large number of modifications have been introduced at the request of the Public Instruction authorities whose requirements appear to have altered considerably since the original plans were approved by them. These changes include the conversion of two dining-rooms into one, the entire remodelling of the servants quarters, extra entrances to the play ground, and numerous structural alterations to the interior of the main building. We are fortunately able to execute them without incurring any excess on the estimates, but the amount of extra work involved by the necessity of altering plans, rearranging prices, etc., was considerable.

The Ministry of Public Instruction have also asked for other additions to the building, notably a house and lawn-tennis court for the English teachers, a boundary wall to enclose the land added to the site since the original estimates, and a hot water supply for the school.

The cost of these was estimated at L.E.4,000 which sum was not available last year; it has, however, been sanctioned for 1904 and the new works will be begun shortly, and. I hope, finished at the same time as the rest of the school.

Mr. Clifton expresses his entire satisfaction with the work of the contractor, M. Basile Antonion. This gentleman undertook the contract at a particularly low price, one in fact which can leave but a bare margin for his profit. In spite of this he has spared no trouble or expense in providing the best materials and workmanship obtainable. Credit is also due to our resident Engineer Ibrahim Eff. Bourhan.

#### F.—Prisons.

The only work in connection with the Prison Department during the past year has been at Zagazig; there a laundry, a kitchen and work-shops have been built and a latrine block is now under construction.

During the absence of Mr. Rodeck, the Prisons Administration architect, on sick leave, M. Slater has been transferred from this office to supervise the Prisons buildings.

#### UPPER EGYPT

## Survey Department.

#### Helouan Observatory.

Meteorological.—This building is on a plateau and the floor level is 114.675 metres above sea level, and is designed with the rooms enclosing a quadrangle. The rooms are all sheltered from the sun by an inner and outer verandah. The main entrance is in the principal façade and faces west and is under the tower containing the 9-ton settling tank. There are also entrances in the quadrangle on the north and south, the latter for access to the annex containing. E.C., bath room, kitchen, servants rooms, store and service E. C's.

The main building contains sitting room and bedroom for the superintendent, dark room, workshop, room for the standard clocks with double walls, rooms for seismographs, anemometers, recording rooms and offices. In all 12 rooms. The ashlar stone pedestals for standard clocks and seismographs are well into the rock foundation. The floors are 1 metre above ground level, hollow underneath and well ventilated with cast iron gratings in the outer walls and arched openings in the inner walls.

A filtering tank receives the water from the 9-ton settling tank, and clear water is distributed throughout the main building and annex. The bath room and kitchen are supplied with hot and cold water. These buildings are founded on rock. English locks are fitted to all doors.

Transit.—This building is 101'60 metres to the east of the Meteorological Observatory and is designed to contain the Transit instrument and the 2 collimators. These are supported on ashlar stone pedestals. The floor level is 118:779 above sea level, hellow underneath and well ventilated. This building is also founded on rock. The vertical and horizontal iron shutters were supplied by Messrs. Cook, of York, England, and were fitted up by M. Boyes, of the Bulak Engine Works. These shutters are all worked from inside.

Equatorial.—This building was designed to carry the 30-feet diameter muntz metal dome supplied by Mr. Cook, of York. The floor level is 125-596 above sea level and the dome roller path is 4:08 above floor level.

The height from floor level to top of the dome is 8.75 metres. The floor is 1½ metres above ground level. Great care had to be exercised in laying the roller path, on the ashlar masonry. The dome and all fittings were erected by Mr. Boyes, of Bulak Engine Works, and as a proof of the excellency of the work done, the dome can be turned round on its roller path with only one hand on the rope controlling the travelling gear.

Magnetic.—The building is of exceptional design, the object being to maintain in the interior rooms for magnetic observations a temperature of from I to 5 cents, also that the hygrometric condition of the air should be such as to avoid moisture being deposited on the instruments. The walls are double, each being 0.75 cents, in thickness with double roofing of the same thickness. There are 3 interior and one exterior rooms with interior passages 1.50 in width all round the 3 rooms. There are 19 ashlar pedestals well bedded into the rock upon which will be placed the magnetic and other instruments. The interior doors are double, padded with cotton and covered with green cloth, and are worked by balance weights. The brass locks and brass basement openings were specially made in England. All the materials used in the building had, of course, to be non-magnetic. All brass work was tested before being put into the building.

The excellence of the site upon which all these buildings are erected and the fact that the surrounding hills are Government property, form a sufficient guarantee, for the future protection of Observatory interests. The transfer of all these buildings from Abbassich to the Mokattam hills on the eastern side of Helwan now, I believe, adequately fulfil the requirements of the Survey Department.

# Ministry of Public Instruction.

Polytechnic School, Ghizeh. (Vice Principal's House).

This house which forms part of the contract for the Polytechnic School now under construction was completed in October. It is a similar house (but larger) to that designed and built in 1902 for the Principal of the School of Agriculture and Polytechnic School.

The cost has been L.E.1,740-327 against L.E.1,588-010 the cost of the latter.

The area occupied is 315 square metres and cost L.E.5,52 per square metre, Mr. Mackenzie's cost L.E.5,87 per square metre.

New Latrines, Beni-Suef and Chizeh Schools.

The new latrines, tank and pump, etc., built at Beni-Suef School will form part of the new School when money is available.

The new latrines built at Ghizch School replace the old Mohamed Aly type to be found in almost all these old schools. The filthy condition of these latrines should be seen to adequately realise their condition. The Sanitary Department should at once condemn all these old latrines such as I found at Edfou, before the new latrines were built in 1902.

## Public Works Department.

South Enclosure Wall, Zoological Gardens.

This wall is 433.40 metres in length and for a short distance crosses the lake. It is built of brickwork with concrete foundations and an artificial stone cap.

The cost was L.E.1,090 or L.E.2,52 per lineal metre.

#### Justice.

Luxor Summary Tribunal.

A Summary Tribunal was built at Luxor for the Ministry of Justice. It is of the type adopted for all Egypt by the Commission appointed in June 1899 and approved by the Judicial Adviser in the same year. Some modifications are being made in the Fayum Tribunal under construction.

#### GENERAL

During the months of January and February the terms of the general and technical conditions for building contracts and the printed forms made use of in the Building Department were entirely revised by Mr. Richmond. As regards the first, the work consisted in arranging the sequence of the existing clauses so as to agree, as far as possible, with the various stages of the operations to which they apply. Existing clauses were, in many cases, remodelled in accordance with

needs indicated by experience. Forty-five new clauses for the most part dealing with technical requirements were drafted. Copies of the proposed conditions were sent to the Inspectors for their opinions on the reception of which the work was again revised before submission on the 3rd March to the legal authorities. After further discussion the draft was sent in its final form to be printed on the 13th April.

The printed forms used for the preparation of quantities, specifications, sanctions, proces-verbaux, and monthly payments were rearranged with the object of allowing wider spaces for figures and thus diminishing the chances of error in sums and quantities. This work was carried out on lines similar to those followed in the revision of the general specification. Preliminary drafts having been prepared they were submitted to the Inspectors for their opinious. After the final form had been decided on 144,700 copies were printed.

The new forms as well as the new general and technical conditions

have been in use since the month of May.

Many demands have been made on my Department for the loan of engineers. Mr. Pastour was occupied on work for the Alexandria Municipality Commission (from September 1902 to the end of that year); Mr. Watson was transferred to the Sudan (from March to September 1903); Mr. Slater, as already mentioned, has been lent to the Prisons Department.

These transfers are extremely prejudicial to the efficiency of my Department especially in view of the limited number of capable officers

at my disposal.

The incompetence of a large proportion of the permanent Tanzim engineers is thrown into bolder relief in proportion as the duties

devolving on them become more arduous.

There has been a considerable improvement in the drawing and working out of details made by the engineers staff. I regret to find that owing to the very low rate of salary which can be paid the tendency is for those who have mastered the general principles to leave us for better paid employment in the irrigation, etc.

The admitted insufficiency of permanent officers has led to the employment of a number of provisoires agents. Many of these are equal or superior in capacity to the graded staff. By Finance Circular, No. 735, dated 30th November, 1901, however, we are forbidden to raise the pay of these employes above L.E. 8. They very naturally resign when better terms are offered.

The Tanzim Department has suffered great loss in the retirement of Said Pasha Choucri to whose long and faithful services I would pay a

grateful tribute.

#### REPAIRS

Appendices Nos. 5 and 6.	The value of the public buildings existing in 1896 may be taken at  Between the years 1896-1903 buildings were constructed to the value of	5,000,000 1,204,000
	The amount required for repairs to the old buildings at an average of 3% equals per annum and for the new at ½%	150,000 6,020 .E.156,020

Against the 156,020 required per annum we have at present a budget allowance of L.E. 58,925 including Prisons, Sanitary and Customs.

Special credits were granted to the amount of L.E. 17,500.

A question which has reached an acute stage is the delapidation of the Government offices in Cairo and the provinces. Many of these are in a state which renders repair impossible, except at a cost out of all proportion to the advantages gained.

Proposals will be submitted in 1904 for reconstruction of the most insecure of these buildings.

The Opera House has been condemned as thoroughly unsafe as regards danger from fire. There are no satisfactory exits.

With the budget at our disposal my report can only be a record of unsatisfactory makeshifts.

Among the more important repairs executed in 1903 may be mentioned.

Modifications to Opera House
Annexe to Printing House
Annexe to Printing House
Conversion of women's Prison at Bulak into girls' School
Partial renewal roof Gouvernorat
Play ground and grand stand for Darb-el-Gamamiz School 1.450 Renewal roof Caisse de la Dette 300 Modification of the Egyptian Institute Sorting room and general modifications Post Office Repairs to Dakahlieh Mudirieh 795
Play ground and grand stand for Darb-el-Gamamiz School
Renewal roof Caisse de la Dette
Modification of the Egyptian Institute Sorting room and general modifications Post Office Repairs to Dakahlieh Mudirieh
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tes that A manufactures are to the state of
to Managara & Calant
Marchenne have March of the second
Province Paral Pin S. J 2475
Repairs to Ras-el-Tin School 3,(00)
Palace 14,500

A certain percentage of the roof area of various ministries has been completely modified. The old system of adding a layer of concrete whenever a leak was discovered resulted in some cases in the imposition of a permanent load varying from  $\frac{2}{5}$  to  $\frac{1}{2}$  a ton per square metre of the supporting joists. The factor of safety was in many cases reduced to 1.

#### RAS-EL-TIN PALACE.

The renewal of the roofs of the palace and its annexes were begun in 1901 and completed in 1903.

The work or repairing a roof area of  $3\frac{1}{3}$  acres was put up to tender on the 5th January 1903, and the whole work was completed in three months for a sum of L.E. 14,500.

The total roof area of Government buildings in Alexandria and Behera (excluding Customs which figure for 10 acres) amounts to nearly 16½ acres.

78% of this area is asphalted.

In 1903 4\frac{3}{4} acres were entirely renovated, the renewal including roof timbers.

The total area renewed since 1901 comes to 10% acres.

Some 60% of the flooring of buildings dating from 1830 is rotten and must be renewed.

An examination into the cause of leakage through the roof of the new ferro-concrete tobacco stores roof in Alexandria led to the discovery of a sag in the main girders, the flexure being in one case  $_{4\frac{1}{50}}$  of the span instead of  $_{10^{50}}$ .

The girder was demolished and in course of this operation it was found that the workmen had omitted to put in the proper number of stirrups forming the web connecting the iron compression and tension bars and that a certain number had been placed upside down.

The efficiency of this excellent system is more or less at the mercy of careless workmen.

The heavy tests applied act, however, as an almost perfect guarantee. The construction and supervision of works of the Customs Administration was withdrawn from my Service for reasons explained in your official No. 7,236 of 25th November 1902 which read as follows:

"It is assumed by the Customs, that the Ports and Lights, by using "their existing staff and the extensive plant they possess, could work "far more cheaply and expeditiously than a contractor. Theoretically "the argument is sound and the project worth a trial."

Some 16 works, detailed below, were carried out by the Customs :-

- 1. Inflammable store on Gabbary Quay.
- 2. Kiosk with 3 rooms for Mamour and storekeepers on Gabbari Quay.
- 3. Kiosk, one room, for guards on Gabbari Quay (gate 32).
- 4. Kiosk, 2 rooms, for guards and gate-keeper on Gabbari Quay (gate 23).
- 5. Foot bridge over railway and coal quays.
- Kiosk, 2 rooms, for gate-keeper with room above for guards (gate 14).
- 7. New 3rd class, Taftich and Passport Office with quarters above.
- 8. Kiosk, I room, for Mamour Kism 7.
- 9. Kiosk, 1 room, for gate-keeper (gate 8).
- 10. Room over guards' office at gate No. 6.
- 11. Painting, etc., outside main building.
- 12. Alteration to stores in Tobacco Department.
- Enlargement of parcel posts by including another store from the Tobacco Department.
- 14. Repairs to roof of old Menoufieh.
- 15. Walls round sheds No. 5, 7, 9, 13 et 14, one metre high.
- 16. Painting, etc. Sheds No. 12, 13, 14, 15 and 16.

Of these only Nos. 1, 5 and 7 were executed by the Port Engineer, but they were, I believe, given to contract and not carried out by utilising the plant or staff of the ports.

The rest of the works were given to contract by the Customs in the same manner as had previously obtained. The execution was not, I believe supervised by engineers.

I infer, therefore, that the spirit of the arrangement made has been infringed and that no benefit has resulted, unless freedom from technical control can, under certain circumstances, be considered as such.

## THE SMALLER MARKAMAS.

Appendix No. 8, In 1901 Mr. Hewat designed two type buildings for Egypt which were approved and signed by the Ministry of Justice. In Muderyah towns there are the Mahkama Ahliyah (which are being built gradually), the Mahkama Sharia and the Mahkama El-Markaz El-Sharia. In districts, the two latter only are required. There are in Upper Egypt 8 Mahkamas Shariyahs and 42 Mahkamas Markaz.

The present condition of these buildings is most deplorable. They are generally dwelling houses, rented and quite unsuitable for the work to be done. Mr. Hewat reports that he found the clerks at work in a room with a mud floor and open to the sky, summer and winter. In Manfalüt much the same state of things obtains. The filthy condition of the many Mahkamas which he visited are, he says, beyond description.

The plans and documents for adjudication have been ready for two years, but no money has been found to build, either large, or small.

#### LIST OF MAHKAMAS SHARIYAH.

(Мопривики).

#### IN UPPER EGYPT.

M

1.—Gizeh Government	TEB
2.—Beni-Suef Rented	
3.—Fayum Government	
4.—Minieh Rented	
5.—Assiut Government	
6.—Guergueh Rented	
7.—Keneh Government	
8.—Aswan Government	

#### LOCAL COMMISSIONS

Appendices Nos. 9, 10, 13, 14, Small water works now exist in the following towns:-

LOWER EGYPT.	TPPER ECVPT.
Mehallet-el-Kebir	Sohag
Kafr-el-Zayat	Minich
Zifta	Girga
Chebin-el-Kom	Luxor
Mit Ghamr	Beni-Suef
Zagazig	Keneh
Benha	
Mansurah	

Installations on a larger scale are projected:-

at	Zagazig		400			•••	* * *	1E.	6,640
	Mansurah			* * *	* * *			**	18,000
	Menuf Chibin-el-F					***	• • •		4,860
	Damietta	71/118							
	Damanhou	r							

At Aswan the capacity of the 10-h.p. engine and pumps was calculated to give a sufficient discharge for road watering in addition to a supply of 25 litres per head taken on 75% of the population.

This provision was in comparison with the measured supply drawn at Tanta very ample and from experience should have avoided the necessity of additional pumps for many years.

The town Council, however, after only two years, are erecting additional engines and pumps of 17-h.p. and have shown a satisfactory profit in spite of undoubted waste of water.

The rejection from motives of false economy of the proposals of the Public Works Department to maintain a mechanical engineer for the purpose of insuring the proper supervision of the water-lifting machinery led to the break down of the Aswan pump and caused considerable unnecessary expenditure.

The engineer has now at my urgent appeal been reinstated. Small fire engines have been bought by the Local Commission of Damanhur,

Aswan and Fayum. The Engineer in Chief of the Local Commissions reports that at present there is no mechanic capable of working them in the villages. (Vide the following extract from the Egyptian Gazette of the 15th May 1904:—

#### "THE FIRE ENGINE.

"Medinet-el-Fayoum's new fire-engine was found to be absolutely "useless this morning when a fire broke out, as the engine could not "work owing to its injector being out of order. As a result the house "where the conflagration occurred was completely burnt out."

In my opinion far too much liberty in technical matters is granted

to the Local Commissions.

The authority of the High Commission which is a purely deliberative body where the opinion for the technical member is only of equal value with that of the non technical does not constitute an efficient check.

## LUXOR, HORSE GEAR PUMP.

In May it was decided to put a pump in the well existing in the English Cemetery, Luxor. Advantage was taken of this opportunity so as to enable us to water the Karnak road and also give sufficient water supply for the cemetery garden from the same well.

A Hayward and Tyler horse gear and deep well pump was ordered. The pump is a 3-throw with barrels 3" diameter and suction and

delivery 2".

The pump is placed 2.50 metres below top of well. The well is 1.50 diameter and the maximum rise and fall in the well (flood and summer levels) is 7.30 metres. The well is 10.30 deep. By opening or closing a valve, either the cemetery can be watered, or the water raised to the road watering tank. A tank of 7 metres capacity with columns, etc., has been erected on the Karnak road.

This tank can be filled in one hour.

The cost was :-

Pump and gearing from Tank columns, etc Masonry foundation, etc.	***	***	 p = 0	***	449	101		64	250 662 534 380
Erection of ironwork							L.E		
			-				-		

#### GIRGA WATER SUPPLY.

The pumping station is placed at the north end of the town. A 4-h.p. Tangye petroleum engine drives a 3-throw vertical double acting pump. The water is raised direct from the river into a 30-ton tank placed on the top of the building. The suction is 5 inches in diameter and the delivery pipes 6 and 5 inches. 751 metres of 5-inch piping and 352 metres of 6-inch piping were laid through the town. At different points in the town arrangements are made for the water supply to the inhabitants and a service adopted for street watering.

The sanctioned amounts were :-

Masonry Pump engine and piping, etc.	0 4 4	 ***	***	***		ж. ()(X) ()74
					1,671	075

The actual cost has been :-

Masonry Pump engine and piping, etc.	*** ***	 ***		184 155
			L.E.1,583	

Balance in hand L.E.87,736.

This pumping station and all others in Upper Egypt are now handed over to the Ministry of the Interior. Future works and repairs will not be taken in hand by us.

## SUHAG WATER SUPPLY EXTENSION.

To admit of a water supply at the higher parts of the town, the tank with a capacity of 28 cubic metres was raised 2.50 metres. A new petroleum engine of 6 h.p. was substituted for the 4 h.p. 278 metres of 5° piping were laid and stand pipes for street watering were placed in convenient places in the town. A 3-throw lift and force pump with 3 vertical barrels and top gearing was substituted for the old centrifugal pump in May 1901.

The works were completed in April 1903, and the total cost of this extension was L.E.472,911.

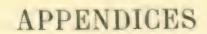
#### WATER WORKS.

Owing to the technical ignorance of many of the Tanzim engineers, great difficulty has been experienced in obtaining reliable data on which to base statistics of the cost of water raised by the local Commissions water works. The bare cost per cubic meter works out at from 0.7 to 1.94 milliemes; if we double the maximum figure to allow upkeep depreciation and amortisation and add 100% for inaccuracies we arrive at a figure of 6 mill. per cubic metre.

This compares eminently favourably with the mill. 27 per m.c. charged at Assiut by the Cairo Water Company and the local Cairo rates of mill. 27 for filtered water, and mill. 23.14 for unfiltered water.

Appendix No. 14.





Appendix 1.
CHIEF INSPECTION SPECIAL BUIDINGS, UPPER EGYPT.

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CHIEF INSPECTION SPECIAL BUILDINGS, LOWER EGYPT.

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## Appendix 3.

# CHIEF INSPECTION SPECIAL BUILDINGS.

LIST A .- WORKS TAKEN OVER DEFINITELY DURING 1903.

-						
Onles.	Attainieration	NAME OF WORK.	Chate of crimpher ton.	Suretton for worke,	Chai exchantre of Architeuts clouries.	NAME OF CONTRACTOR.
				L.E.	L.E.	
A.	Heneral.					
1		Repution Museum Residence of Director Gl	20-10-902	4. [130]	4,46146	Garozzo & Zaffrani.
2		Egyptian Museum Police Quarters	2.412.500	880	7,3%	Garrosso & Zaffenni.
3		Arab Museum & Khedivini Library	14)-9-9(12	57,142	a5,8}a	Marsili & Tréluki.
4		Boulae Stables	22-0-902	10,000	8,970	Zaffrani, Annigoni and Gambobi.
5		Tanta fanziu Office	4-6-909	2,(KH)	1,902	Marguesof Buy.
0.5		Model Workshop	15-14-902	11,083	10,924	Trébukt
B.	Interior.					
1		Police Barrake Nawa	1-7-902	2,800	2,516	Ali Buinwi.
O.	Inution.					
1		Cairo Native Court of Appeal braining	3-8402	2,140	1,5910	N. Marciano.
41		Port Sald Summery Law	29-12-902	1,950	4,886	Guétin & Charvant
D.	Editorition.					
1		Addition of 3 rooms to Abbus School	29-9-1413	650	F# # #	Zaffrani, Annigoni and Unadolii.
E.	Prinsus.					
1		Block F. and Laundry, Manshla Prisons		_	15,146	N. Prosperi.
9	de	Zagazig Haspital	1-9-902	-	4,27.1	Ohezzo & Fedrigo.

Appendix 4.

# SPECIAL BUILDINGS, LOWER EGYPT.

Table showing cost per methe square and methe oube of buildings taken over finally in 1903.

							-		
	NAME OF WORK.	Tows,	Total coss excellector	Surface myorad.	Volume.	Cont.		Cast per Mi-	Dishibilyzon.
			L. II.	Ma	Ms	1.E. M.	LaMa	17. 33.	
Arnh	Arnh Museum & Khodivial Lilmery	in the second	28,812	18.03	019:16	74		0	Part, busement, ground thour, 1st floor and 500 Mª 2nd theor.
Real	Residence of Director Commend Egyp-	Cutto	1,614	21815	0,015	12 (652		202 0	Basement, ground Bour, Let their and 108 M2 2nd thour.
Poll	Poller Charlery Egyphine Museum	Calro.,	35 55 1 *	208	1,688	100		11 6135	
Bula	Bular Statistics	( MITAL	WALT.	1.471	9,240	501 D		11.6 11	
Tunk		Tiblita	1,766	pant 2 to pant	1.HK0	14 327		0.089	
Mad		Cuiro.	10,611	5,625	24,496	\$ 1H650		130	
100	Pesting Burneke	Nawn .	Police	â	1,670	33	Ī	110	Grains Boor, and 154 Mr 1st flaw.
Add	Addition of 3 rooms to Abbus School	Chira		251	19.0	=======================================	\$1	13.00	Remains & markets high.
1	Archives for Native Court of Appeal.	Cairo	I,9thi	THE STATE OF THE S	180°S	20	t== 000 000	# SHE	Stanta storey.
lo Sum	Summing Law Courts	Port Said.		Hills	4.230	35 15	360	1010	Fingle Borey.
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From Balfway between ground level and button of foundation, or where there is basement from his way between basement theor and bottom of foundation to roof level, inglecting parapet for the roofs, or to half way up slope of sloped roofs.

Wooden vorandalis, sheds, are ignored in calculating the volumes, though their cast is included. N.B.-The heights for calculating the volumes are measured as follows :-

## Appendix 5.

# GENERAL STATEMENT OF NEW BUILDINGS

EXECUTED

# WITHIN A PERIOD OF S YEARS COMPRISED BETWEEN 1896-1905.

LARGE BUILDINGS.		
	L.R.	¥.
Museum of Egyptian Antiquities (Constructions and Sundries)	256,521	-
Arab Museum and Khedivial Library (Price of land and furniture not included)	51,300	_
Native Court of Appeal, Governorate and Mixed Prison (Price of land and furniture not included)	92,000	_
Total	309,821	
SCHOOLS.		
	L.E.	ы.
Assuan	2,515	_
Caire (Model Workshop)	14,250	-
., (Nasrieh School)	29,958	-
(Abhas School)	7,256	-
(School of Girls) Teachers' house	789	_
Chibin-el-Kom	8,000	_
Damietta	1,108	_
Damaahour	776	_
Esneli	5,826	_
Guizeh (Agricultural School)	21,450	_
Minich	4,293	-
Port-Said	4,300	_
Total	100.521	_
TRIBUNALS.		
	L. 30.	34.
Ayat and Port-Suid	7,000	_
Chibin-el-Kom	3,335	-
Dessouk	1,481	-
Hehin (Mehkémé Charich)	462	-
Minich et Mehalla	3,630	_
Sedfa	1,387	
Soling	2,442	_
Total	19,737	_

## Hospitals.

								L.E.	£ .
Lunaties' Asylu	m. Cai	ru			01 001			Tinginini	
Alexandria (info							400	5,000	_
					04 985			10,908	_
					40 461		107	1,854	
Beni-Suef, Dan							200	Tomber Cont.	_
Cairo (enlargen	ent K	man)-	Aini E	lospite				25,350	
Cairo Bacterio	lamical	Labo	ratory.	nt t	he H	ospita	of.		
Kas-el-Aini	***					_		978	_
Cairo (local vac				044 / 1				424	-
Chibin-el-Kom		204 81		***			***	5,079	_
Minia						14 600	0.69	7,500	-
Mansourah		604 91		4				1,249	_
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Damietta								_	_
Mansourah							, ,	1 -	
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Benha								582	_
Beba								485	_
Cairo								6,334	
Chibin-E-Ko	m							513	_
Damanhour .								1,832	_
Damietta									_
W79									
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Pert-Said (Gover Galioubieh (Mud Fayum (Annex t Keneh (Mudiriel Alexandria. Po "Mo "Fle Atf.—Police Sta Abnub.—Markas Aboujerkas Achmoun Badari Beha Belbeis Baltim Beni-Suef Cairo,—Caravol	morate lirs' ho o Mud h) live Ba harren eming ( ation	use) irich) rrabke a Bey Carace	s; Q Car ol	Duny neol					18,000 1,627 494 1,000 1,783 758 2,695 710 1,822 1,698 1,731 1,689 2,034 3,572 784 6,500 3,000	
Port-Said (Gover Galioubieh (Mud Fayum (Annex t Keneh (Mudiriel Alexandria. Po "Mo "Fle Atf.—Police Sta Abnub.—Markaz Aboujerkas Achmoun Badari Beba Belbeis Baltim Beni-Suef Cairo,—Caravol	morate lirs' ho o Mud h) live Ba harren ention Darb	use) irich) rrabic a Bey Caraco	s; Q Car ol	Duny neol					18,000 1,627 494 1,000 1,783 758 2,695 710 1,822 1,698 1,731 1,689 2,034 3,572 784 6,500 3,000 1,343	
Port-Said (Gover Galioubieh (Mud Fayum (Annex t Keneli (Mudiriel Alexandria. Pe  Mo Fle Atf.—Police Str Abnub.—Markaz Aboujerkas Achmoun Badari Belba Belba Belleis Beni-Suef Cairo.—Caravol	morate lirs' ho o Mud h) lice Ba harren enting t ation Darb	use) irich) rrabke a Bey Carace	s; Q Car	huay					18,000 1,627 494 1,000 1,783 758 2,695 710 1,822 1,698 1,731 1,689 2,034 3,572 784 6,500 3,000 1,343 617	
Port-Said (Gover Galioubieh (Mud Fayum (Annex t Keneh (Mudiriel Alexandria. Po " Mo " Fle Atf.—Police Su Abnub.—Markaz Aboujerkas Achmoun Badari Belba Belbais Belbais Beni-Suef Cairo.—Caravol	morate lirs' ho o Mud h) lice Ba harren ening ( ation  Darb Pyran Sayeda	use) irich) arrabk a Bey Carace Carace El Ah aids a Zena ayli	s; Q Car	huay acol					18,000 1,627 494 1,000 1,783 758 2,695 710 1,822 1,698 1,731 1,689 2,034 3,572 784 6,500 3,000 1,343 617 656	
Pert-Said (Gover Galioubieh (Mud Fayum (Annex t Keneh (Mudiriel Alexandria. Pe  " Mo " Fle Atf.—Police Su Abnub.—Markaz Aboujerkas Achmoun Badari Belba Belbais Belbais Cairo.—Caracol	morate lirs' ho o Mud h) lice Ba charren eming ation  Darb Pyran Sayech El Wa	use) irich) arrabk a Bey Carace Carace El Ah aids a Zena yli	s; Q Car	huay neol					18,000 1,627 494 1,000 1,783 758 2,695 710 1,822 1,698 1,731 1,689 2,034 3,572 784 6,500 3,000 1,343 617	
Port-Said (Gover Galioubieh (Mud Fayum (Annex t Keneh (Mudiriel Alexandria. Po " Mo " Fle Atf.—Police Su Abnub.—Markaz Aboujerkas Achmoun Badari Belba Belbais Belbais Beni-Suef Cairo.—Caravol	morate lirs' ho o Mud h) lice Ba charren eming ation  Darb Pyran Sayech El Wa	use) irich) arrabk a Bey Carace Carace El Ah aids a Zena yli	s; Q Car	huay acol					18,000 1,627 494 1,000 1,783 758 2,695 710 1,822 1,698 1,731 1,689 2,034 3,572 784 6,500 3,000 1,343 617 656	

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Desaits	1.894	_
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Dell'ut	1,1086	_
	3,704	
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TO	1,130	_
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17	1,645	_
3 CH 1	1,714	-
Kom-Hamuda	2.846	_
ne e 1 .	1.682	_
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<b>%</b> Y	3,347	_
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C N. J. J	1,644	_
79.1	1,748	-
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	1,648	_
Zertia	94,706	
Total	24,700	
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Alexamiria	24,245 475 25,843 43,061	_
Alexamiria	24,245 475 25,843	
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Alexamiria	24,245 475 25,843 43,061 35,452 2,000 11,385	560 440 —
Alexandria	24,245 475 25,843 43,061 35,452 2,000 11,385 20,000	560 440 —
Alexandria	24,245 475 25,843 43,061 35,452 2,000 11,385 20,000 162,462	560 440 —
Alexamiria	24,245 475 25,843 43,061 35,452 2,000 11,385 20,000 162,462	560 440 —
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Alexandria	24,245 475 25,843 43,061 35,452 2,000 11,385 20,000 162,462 4E. 37,223 38,274 4,878 780	560 440 — — — —
Alexandria	24,245 475 25,843 43,061 35,452 2,000 11,385 20,000 162,462 4e. 37,223 38,274 4,878 780 923	560 440 — — — —
Alexamiria	24,245 475 25,843 43,061 35,452 2,000 11,385 20,000 162,462 4,878 780 923 1,865	560 440 — — — —
Alexamiria	24,245 475 25,843 43,061 35,452 2,000 11,385 20,000 162,462 4.87.8 780 923 1,865 2,530	560 440 — — — —
Alexamiria	24,245 475 25,843 43,061 35,452 2,000 11,385 20,000 162,462 4.E. 37,223 38,274 4,878 780 923 1,865 2,530 4,339	560 440 — — — — —
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# QUARANTINE STATIONS.

	L.R.	м.
Alexandria.—Mex	9,118	_
Gabal El Tor	41,721	_
Port-Tewfik	874	
		_
Total	51,713	_
Post Offices.		
	L.E.	M .
Alexandria.—Annex	665	_
Abou-Kébir.—Annex	1388	-
Cairo.—Enlargement	14,509	_
Ebeheway	457	_
Mansurah	773	_
Port-Said	24,552	
Total	41.344	_
TANZIM OFFICE.		
	L.E.	м,
Damanhour	1.227	_
Tanta	1,902	-
Sohng	3,396	-
Total	6,525	_
100ti ,	0,0200	_
SUNDRIES.		
	Ł.E.	М.
Annex Ministry of Justice Sundries p.c	874	_
" Sanitary Service	1,497	-
	2,100	_
Caisse de la Dette		
Survey Department.—Guizah	1.057	_
Survey Department.—Guizeh	1,057 2,500	_
Survey Department.—Guizeh School of Agriculture (dairy and stables) Zoological Gardens, Guizeh (2 pavilions)	1,057 2,500 1,500	
Survey Department.—Guizeh School of Agriculture (dairy and stables) Zoological Gardens, Guizeh (2 pavilions) (pavilion for large animals)	1,057 2,500 1,500 1,898	_
Survey Department.—Guizeh  School of Agriculture (dairy and stables)  Zoological Gardens, Guizeh (2 pavilions)  (pavilion for large animals)  (cage for animals)	1,057 2,500 1,500 1,898 4,000	_
Survey Department.—Guizeh  School of Agriculture (dairy and stables)  Zoological Gardens, Guizeh (2 pavilions)  (pavilion for large animals)  Local for reproduction of plans	1,057 2,500 1,500 1,898 4,000 2,655	
Survey Department.—Guizeh School of Agriculture (dairy and stables) Zoological Gardens, Guizeh (2 pavilions) (pavilion for large animals) (cage for animals) Local for reproduction of plans Port-Said Lazaret	1,057 2,500 1,500 1,898 4,000	
Survey Department.—Guizeh  School of Agriculture (dairy and stables)  Zoological Gardens, Guizeh (2 pavilions)  (pavilion for large animals)  (cage for animals)  Local for reproduction of plans  Port-Said Lazaret  Local Photographies	1,057 2,500 1,500 1,898 4,000 2,655	
Survey Department.—Guizeh  School of Agriculture (dairy and stables)  Zoological Gardens, Guizeh (2 pavilions)  (pavilion for large animals)  (cage for animals)  Local for reproduction of plans  Port-Said Lazaret  Local Photographies  House for Director of School of Modecine	1,057 2,500 1,500 1,898 4,000 2,655 3,000	
Survey Department.—Guizeh  School of Agriculture (dairy and stables)  Zoological Gardens, Guizeh (2 pavilions)  (pavilion for large animals)  (cage for animals)  Local for reproduction of plans  Port-Said Lazaret  Local Photographies  House for Director of School of Medecine  of Zoological Gardens	1,057 2,500 1,500 1,898 4,000 2,655 3,000 581	
Survey Department.—Guizeh  School of Agriculture (dairy and stables)  Zoological Gardens, Guizeh (2 pavilions)  " (pavilion for large animals)  " (cage for animals)  Local for reproduction of plans  Port-Said Lazaret  Local Photographies  House for Director of School of Medecine  " of Zoological Gardens  Museum of Society of Geography	1,057 2,500 1,500 1,898 4,000 2,655 3,000 581 2,340	
Survey Department.—Guizeh  School of Agriculture (dairy and stables)  Zoological Gardens, Guizeh (2 pavilions)  " (pavilion for large animals)  Local for reproduction of plans  Port-Said Lazaret  Local Photographies  House for Director of School of Modecine  " of Zoological Gardens  Museum of Society of Geography  New Geological Museum	1,057 2,500 1,500 1,898 4,000 2,655 3,000 581 2,340 713	
Survey Department.—Guizeh  School of Agriculture (dairy and stables)  Zoological Gardens, Guizeh (2 pavilions)  (pavilion for large animals)  Local for reproduction of plans  Port-Said Lazaret  Local Photographies  House for Director of School of Medecine  of Zoological Gardens  Museum of Society of Geography  New Geological Museum  Firemen's Central Station, Cairo	1,057 2,500 1,500 1,898 4,000 2,655 3,000 581 2,340 713 951	
Survey Department.—Guizeh  School of Agriculture (dairy and stables)  Zoological Gardens, Guizeh (2 pavilions)  (pavilion for large animals)  Local for reproduction of plans  Port-Said Lazaret  Local Photographies  House for Director of School of Modecine  of Zoological Gardens  Museum of Society of Geography  New Geological Museum	1,057 2,500 1,500 1,898 4,000 2,655 3,000 581 2,340 713 951 4,602	
Survey Department.—Guizeh  School of Agriculture (dairy and stables)  Zoological Gardens, Guizeh (2 pavilions)  " (pavilion for large animals)  Local for reproduction of plans  Port-Said Lazaret  Local Photographies  House for Director of School of Medecine  " of Zoological Gardens  Museum of Society of Geography  New Geological Museum  Firemen's Central Station, Cairo	1,057 2,500 1,500 1,898 4,000 2,655 3,000 581 2,340 713 951 4,602 18,675	

# RECAPITULATION

		L.B.	М.
Large buildings, Museums and Courts of Justice .	q 9	399,821	-
Schools		100,521	
Tribunals	**	19,737	_
Hospitals		118,392	_
Desinfection Stations		3,145	_
Slaughterhouses		49,759	_
Governorates, Mudiriehs and Markaz		94,706	_
Prisons		162,462	-
Custom-Houses and Coast-Guards	* * *	101,446	
Quarantine Stations	• • •	51,713	_
Post-Offices		41,344	_
Tanzim Office		6,525	_
Sundries		54,943	-
Grand Total		1,204,514	_

Appendix 6.

Inspection.	TOTAL NUMBER	TO	TAL S	PENT ON		GRAND T	OTAL.
some net (US).	REPAIRED.	Ogors		Speci Cand		SPENT	r.
		L.E.	ы.	L.E.	94.	112	31
East	92	3,771	835	3.115	_	6,886	835
West 11.	170	5,112	:\$e14	25,467	ООО	30,579	369
Cairo Buildings	47	7,383	8 36 MT	7,002	(HH)	14,385	000
Delta Buildings	18	1.407,	0410	* •		1,407	(1616)
				Total	L.E.	53.258	2(14

Appendix 7.

TABLE OF PRIME COST OF NEW SMALL BUILDINGS EXECUTED IN 1903.

		Print	ant m.c.	1	3		0,480	0.620	0.600	1	0.700	
			Volume per m.c.				000	1,000	132	1	11.0 11.0	
than belian	refer.		cont and	myz.j			-1	1	ı	Į.	1	
	11		114 die	I,uu			1	-	1	١	1	
Benifelinern	with dwarf		K 1st 1	of at -W			1	1	1	Γ	ŧ	
	Rutte In.		N 200	ी कार्यतु			1	L	Ī	1	1	
	Euclosure walls.	-	lat Ni	sunito V			1	T	į.	1		
			ng "K s	al antid	L.M.		Î	1		L.ONZE	1	
	Vernadalis.	-	Jen .v.n	mating			1	1	l.	M. M. M. M. 3,50 3,50 32,00		
	Verbi	-		ALFILE			1	-	1	8 E		
				Issnath			1	1	1	2 % 1 %	1	
		Ť	mt ghe,	Prior	1		8.	S, family	37033	1	1	
	Surface noveral,		Without	'all file			F 54	N SEE	20 DE	ł	ı	
	duce es		urd.	-anti-d	3		24 H H H	574	240 B.003	1		
	25 E		Without court-yurd.	-MILDE.			M.	28.5	G PR	157.00	5. 13.	
			Total		4		2	10%	Q F	15	88	
			Number of Runes.				-	R. d. Ch.	-	F	B. d. Ch.	
			DESCRIPTION OF BUILDINGS.			CAIRO.	Construction of a sorting ruom on the lat floor of the new addition at the Free Office	Enlarging the general store rooms of the Printing house	Construction of a room over the less floor of the Chemical Lab-humbury	Construction of a manyties of the main entrance of the Opera Rouse	Construction of a room for the	
	11		raequi	$n_N$				T 4	200	-	17	

# Appendix 8.

# MINISTRY OF JUSTICE

LIST OF MARKAMAS EL-MARKAZ EL-SHARIYAH IN UPPER EGYPT.

Mahkamas-el-Markas El-Shariyah,	Government property or Rented.	Mulikanna-el-Murkuz El-Shariyah.  Government property or Rented.
Embabelı	Government.	El-Saf Rented.
Ayat	Rented.	Guizeh
Beni Suef	9-9	Bebeh
Wasta	Government.	Sennoures
Fayum	Rented.	Etsa
Minieh	99	Facha
Мадада	9.9	Beni-Mazar
Abou Korkas	95	Samalut
El-Wahal-el-Bahariyah	9.9	Manfalut Government,
Abu Tig	Government.	Mallawi
El-Wahal-el-Dakileh		El-Wahnl-el-Khariga
Tahta	Rented.	Deirut Rented.
Badari	**	Assint
Abnub	44	Baliana
Suhag	4.0	Akmime
Guirgueh	Government.	Dechna Government.
Kosseir	0.4	Esneh Rented,
Kenelı	Rented.	Lnxor ,,
Nag Hamadi	9.4	Kous
Edfo	Government.	Aswan
Korosko	Rented.	Abi-Hore

Appendix 9.

Maintenance of Town Roads from 1902 to end 1903.

Towns.	YEAR.	Water,	Lighting	Ronds and Gardens.	Sundries.	TOTALS.	BUDGET.
		L. E.	L E M.	L. K.	1 E.	L. E.	I., V.,
Direction Delta							
Tanta	1902 1903	358 615	539 540	1,129 1,207	78 200	2,106} 2,653}	2,500
Kafr-el-Zayat	1902 1903	37 37	186 320	571 596		795) 954)	1,000
Mehalla	1902 1903	50 50	382 388	270		1.018) 2.387)	1,200
Zefta	1902 1903	38 38	475 475	971		1,058 1,440	
Chébin	1902 1903	39 39	412 · 447 ·	, , , , ,			
Menouf	1902	10 20	148 . 82 .	13030			
Direction East							
Suez	{ 1902 1903	50 50	700 . 700 .	1,14			
Damietta	1903		290 90 256 70	1		789 1,143	
Zagazig	1902 1903		416 . 419 02	. 1.21 0 1,33			
Mansourah	\$\frac{1902}{1903}			18		1,137	
Port-Said	1902 1903		2,505 9		27	6.87	3
Mit-Ghamr	1903 1903				14	4 7	1,200
Direction Wes							
Damanhour	1903	3 295	••	8	71 1	8 1.18	5 1,500
Benha	190	3-	181 4	51 683,2	71	864,72	2 1,000

Appendix 10.

SUMS GRANTED TO LOCAL COUNCILS SINCE THEM CREATION IN 1894 TO 1903.

	Test	5.2	18:45	1891	X9.8.	1899	0061	1061	5061	1903
-	2500	9,500		9,500	9.500	S S C S	9 500	25.	6.500	0000
		1,200 1,200 1,200 1,200	100 J	0.000 1.500 1.500 1.500 1.500	0001	1,200	0071	55555		2001.200
311	0	1,877-454	0525 2025 2025 2025	9,250 0,250 0,500	5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0888	200		0027 2027
130		2,750	152	057.5	(K.7.%)	2,750	2,730	M.7.50	2,750	0.750 2.750
1=	_	U.M.	1,5(8)	1,500	1,5181	1,500	1,340	1,3610	1.500	1,5(N)
=	1,000	1,(00)	1,000	(MKO*1	1,000	I.(NN)	1,000	1,000	1,000	1,000

Appendix 11.

Tanzim Rorhsas delivered in 1902 & 1903.

Years.	Towns.	for Buildings and Repairs	for Occupation of the public road	lor Verandahs.	Totals,	Herripta.
	Direction Delta.					Lati. Ma
1902	Tantah	310 391	718	11 20	1079	603 402 923 264
1902 1903	Knfr-el-Zayat}	70 97	140 127	2	212 228	107 092 114 050
1902 }	Mehalla	282 327	214 204	_	526 531	191 770 214 480
1902 }	Zifta,	113 121	7 <u>4</u> 79	=	187 200	82 785 71 700
1902	(Thibin)	176 231	52 79	22 26	250 336	72 840 111 140
1902 }	Menonf	151 218	32 67	7	190 292	60 795 192 275
	Direction East.					
1902 1903	Zagazig	204 300	149 272	23	436 603	198 810 331 685
1902	Mansourah	285 331	350 294	24 21	659 646	419 394 285 234
1902 1903	Suoz	93-105	174 149	2	269 256	121 318 122 781
1902 1903	Port-Said	286	551	1117	940	362 677
1902 1903	Isumillieh	40	=		43	12 460
1902 1903	Danietta	244 225	066 78	3 7	313 310	117 336 122 438
1902 1903	Mit-Game	498 241	1 <u>99</u> 93	=	620 334	145 132 124 839
	Direction West.					
1902 1903	Damanhour	269 249	79 107	8 26	356 401	114 900 156 481
1902 1903	Rosetta	78 195	=	6	84 200	20 220 26 160
1903	Benha	100	85	9	194	89 728

Appendix 12.

Expropriation and Sale of Zhadet Tanzim, 1902 - 1903.

		Ka	CPROPRIATIO	on.	ZIADETS SOLD			
Years	Towns	Areas.	Sums paid.	Rate of M?	Arms	Sums received.	Rate of Mr	
	To		L.E. M.	L.L. M.	Nz	I.L. M.	LE W	
1902 }	Direction Delta.  Tantah	51.78 59.36	155°014 137°015	3.000 3.000	303 37		0.089	
1902 }	Kafr-el-Zayat	=	=	=	=	=	Ξ	
1902 }	Mehalla Kobra	=	=	=	172 267	[36] * 6 M M M		
1902 (	Zifta	=	_	=	269 118	3-175	150	
1902 1903		\$\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	179 · 866 158 · 331	0.364	221 26	28 · 457 14 · 578	The State of the S	
1902 1903	Menouf	28.25	9.079	0.321	46 88	25°000	3	
	Pirection Fast.							
1902 1903		\$\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	68°875 141°348		69	550 - 00 08 - 08		
1902 1903	2 35	1246 · (X) 1425 · 14	225 · 094 443 · 423		46 127	38 - 35   86 - 19		
1902 1903		2:80 23:32			23	0.06		
do.			(Néant		582	48.64	4 0.083	
1902 1903	Damietta	-\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \			810	101 - 24		
1902 1903	Mit-Ghame	2796 · 10		0 0 0 0 0 0 0 0 248	158 108		x inconnu re à la Mond.	
	Direction West	1.						
190; 190;	2 Damanhour	}			SOS	62:99 316:85		
1909	Rosetta	\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\			111 493	3:3:		
190	Benha	335•5	95 194.85	26 0 5808	539 26,7	1 21-1	18 0 79064	

Appendix 13.

LIGHTING AND SUNDIGES.

Cost of Adminis- tration.	Lall.	90%	255 255 255 255 255 255 255 255 255 255		2422 1122 1122 1122 1122 1122 1122 1122		
Farchase of Zadet Teresim	L.E.	137,015	2.094 30.000 14.578 25.000		222-168 20-080 108-860		6.540
Beauryr Fund.	i		879.120 122.101		316.128 37.000		100
Sanitation experience per infahitant	2.2	200	0.007123 0.007123 0.001034		0.001		0.08466
Sanitary Budget.	1. E.	5	282283 282283		200 100 100 100		150
Arminal mast of lighting per Laberhitant.	lE.		0,009431 0,3129 0,0125 0,03178 0,0416		0.049 0.049 0.012 0.024 0.028 0.025		0.000122
Annual out of Highelia	E. R.		28252		Series Se		204.
Cost	L.E.		1.588 1.883 2.105 1.75796 5.9636		2.183 2.100 2.100 2.741 2.741 2.183		
Number of Interne.			RESERS		목갖지되었으		180
Kind of lighting.			Petroleum.		Mineral Oil Gas Petroleum, Electricity, Petroleum,		Petroleum.
Ares of resul	N13		16/137.382 720/0.215 10000 89500 68822 32604		190167 421700 270880 RESURN INDERNO		STREET
Tows		Direction Delta.	Kafr-El-Zayat 72010, 215 Nehulla Kebira 198800 Zafta 89500 ('hebin-El-Kom 18822 Menouf 32604	Direction East.	Suez Port-Said Zagazig Munsourah Damietta	Direction West.	Danuanbour

Appendix 14.

WATER RAISING MACHINERY.—COST OF WATER, 1983.

fatala	Percentage of Paris 2			(00)		0./,0	122
Number or Intendituals	Annual Miles and Annual Miles and Annual Walles and Indicate and Indic			57289 100	3500 34 °	138KH 40"/.	S S S S S S S S S S S S S S S S S S S
	Cost her one E.H.P.			-	1.93 HX.X4	H.CHE	F65 40.088 F65 40.088 F711 76.924
	capatil equit hel year)			1	23.	0.713	
i ok.	Into I			1	13.30	8.300 18.550 0713 14.000	175.7 186.5 188.5 188.5
CONT. IN MILLIMIN WER HOUR OF	south a mirel			- 1	5		20.01 20.02 20.03 20.03
L. LEGALDS	.* inshdu.i			į	0.21	2.040	21.915
IL IN MER	Walter while			1	C.C.	T	31 21 22 32 32 32 32 32 32 32 32 32 32 32 32
Crass	Patrolenn.			L	87.50	5 77 ×	13.88
	O Ma liftent her hour.			1	1-	502	드림을
on2108[	7. H.Y. or E.H.P. litters × 35. ÷ 1011			Ī	132	1.270	0 :0 :0 :0 :0 :0 :0 :0 :0 :0 :0 :0 :0 :0
	Approx Q litter per sec.			1	771.	1.220	7.5. 1.5.
	Total lift mem.			1	7m . 1	Z	9.75 11.08 2.51
,31	sensit set Water Dinners				**	9 70	202
	thous Work of Pump.	11.38		1	-	21	(C) C
	Jegind InhiT	I.a.E.		2,300	J.CKM)	1.2/3	1,200
	Population.			57289 2500	10231	31791	14039 20705
	TOWN.		Direction	Tunta	Kafr ElZayat	Mehnllu	Zifta (bebine

(2) Quantific d'uni paindie 5,518,740 Illiese Cle, des Raux (2) Markline d'arrelage. (1) Markline d'un polible

#### Appendix 15.

# DUTIES OF THE DISTRICT TANZIM ENGINEERS.

For P. W. D. Tanzim.—Permits, plans, contraventions, alignments, expropriation, estimates examination of insecure houses.

Technical Service.—Plans of engine installations.

Finance.—Sale of land, plans, survey and banding over.

Local Commissions.—Projects, roads, levelling, lighting, watering, gardens, waterworks, tramways, telephones.

Sanitary.—Cemeteries, choice of survey.

#### Appendix 16.

# SOME CHARACTERISTICS OF LOCAL BRICKS

TABLE I.

RATE OF ABSORPTION OF BRICKS.

						F1 .		Luring
	Percent	nge of w	uter thy	volume)	ubsorbest	witer un	mersion (	freezerek
CLASS OF BRIEKS.	Minute	2 Minutes	Minutes	10 Min.	à Hour	t Hour	24 Hours	ta Henra
Zaffrani	27.99	32.71	33.07	33.10	23.18	33.25	34.45	
EDITS C PERSON								
Mieli	14.16	14.74	14.97	15.15	15.46	15.79	17.87	
Tunzim	22.12	23.40	23.49	23.57	23.83	23,93	26.87	27.39
Bircher (Ordinary)	17.04	26.47	30.92	32.17	32.40	32.4.	33.26	33.59
(Machine)	6.76	12.25	15.55	10.2	24.10	26.34	1 27.01	27.18
	1			1	_	1		1

TABLE II.

## ABSORPTION.

	Percus		water abs	sor bed	Percentage of water absorbed by weight.				
CLASS OF BRICK.	P Expurement	s fesperanni.	= Paparinnen	Menn,	P Experiment.	> Kaywelmani,	F. E. Spandenedeli.	Mean.	
Zaffrani	34.80	33.54	34.45	34.26	22.66	21.85	22.89	22.47	
Mieli			17.87		10.85				
Tanzim	23.10	20.63	27.39	23.71	16.19	14.46	19.03	16.56	
Bircher (Ordinary	35.46	34.43	33.59	34.49	22.47	21.82	21.12	21.80	
(Machine)	24.42	27.70	27.18	26.43	13.33	15.12	15.76	14.74	

TABLE III.

	Weight of	Cube of		Volume of	Absourtion.		
CLASS OF BRICKS.	Bricks dry Kgs.	Rricks Ma	Hricks por M1 dry Kgs.	water absorbed to Ma	Percentage of Weight	Percentage of Volume.	
Zaffrani	191.87	0.125	1535	0.043	22.47	34.26	
Bircher (Ordinary)	203.58	0.128	1584.3	0.045	21.80	34.49	
(Machine)	220.83	0.121	1831.3	0.031	14.71	26.43	
Tanzim	234.75	0.164	1427	0.036	lü.hi	23.71	
Mieli	198.13	(), [2()	1651	0.021	10.37	17:39	

TABLE IV.

General Characteristics of Bricks.

	Weight of Bricks	Specific	Arson	CRACKING LOAD.	
CLASS OF RHICKS	per M <sup>1</sup> dry Kgs.	Gravity.	of Volume.	oe of Weight	Kgs per Cm
Zaffrani	1535	2.3	34.26	22.47	13.85
Mieli	1651	2.1	17.39	10.37	12.58
Tanzim ,	1427	1.0	23.71	16.56	8.20
Bircher (Ordinary)	1584.3	2.4	31.49	21.80	72.17
(Machine)	1831.3	2.4	26.43	14.74	104.46
Marsili	_		_	_	29.59

TABLE V.

RESULTS OF INDEPENDENT TESTS.

	ricks Sgs	of rick»	lat of per M. Kgr.		d water 100 briel		A Breeze	PTION,
CLASS OF BUICKS.	Weight John B dry J	Los B	Weigh Brick- dry.	tot Trat	2nd Test M*	Menn. M°	Percent age of vol. %	herent age of
Zaffrani	189	0.120	1575	() <u>.(t</u> lu)	0.0432	u.0416	34.7	22.03
Bircher (Ordinary)	205	0.130	1577	0,045	0.047	0.046	35.38	22.44
(Machine)	-	_	-		-	-	_	
Tanzim	233	0.160	1456	0.045	01,040	0.0425	26.56	18.24
Mieli	195	0.120	1625	0.030	0.030	0.030	25	15.32

TABLE VI.

CHARACTERISTICS OF ENGLISH BRICKS.

Remains   Rema							
Bricks weak red 2002 — — 38.67 — Bankine's civil Eagineering Mitchell's Eading Unstruction.  Brick fire 2163 — — 119.53 — Unburnt Bricks — — — 4.02 36.21 Grant.  Common Red 1894.7 — — 25.19 151.16 Latham.  Machine-made — — — 86.83 124.50 Latham.  Formed Red 1901.6 — — 36.59 113.41 Grant.  Farcham Reds 1901.6 — — 36.59 113.41 Grant.  Gault — — — — 53.57 148.97 Grant.  Gault — — — — — 31.67 157.49 Grant.  Pressed — — — — 31.67 157.49 Grant.  Stafford dressed Blue — — — 60.02 441.47 Latham.	CLASS OF BRICKS.	Weight per Ma dry.		Abnorphice Personange of Weight.		Counting Marse.	REMARKS.
Bricks strong 2002 Bricks strong 2163 - 56.25 77.34 - Engineering Mirchell's Eaching tonstruction.  Brick fire 2163 - 119.53 - 119.53 - 119.53 - 119.53 - 119.53 - 119.53 - 119.53 - 119.53 - 119.53 - 119.53 - 119.53 - 119.53 - 119.53 - 119.53 - 119.53 - 119.53 - 119.53 - 119.53 - 119.54 - 119.55 - 119.5		Kgs.			Kgs. per cm*.	Kga. per cm².	
Bricks strong  Brick fire	Bricks weak red	5000		-	38.67	-	
Brick fire	Bricks strong	to	2 to 2.17	_	56.25 77.34	-	Balding
Common Red 1894.7 — 25.19 151.16 Latham.  Machine-made — 86.83 124.59 Latham.  Formed Red 1843.3 — 10.5 43.78 560.37 Latham.  Farcham Reds 1901.6 — 36.59 113.41 Grant.  "Rubbers 1605.4 — 4.49 50.41 Grant.  Gault — 53.57 148.97 Grant.  "Wire-cut — 29.10 149.62 Grant.  "Pressed — 29.10 149.62 Grant.  Stufford dressed Blue — 60.02 441.47 Latham.	Brick fire	2163	-	_	119.53	-	Construction.
Machine-made       —       —       —       —       86.83       124.50       Latham.         Formed Red       —       —       —       10.5       43.78       560.37       Latham.         Common Stock       —       —       1901.6       —       —       36.59       113.41       Grant.         Farcham Reds       —       —       —       36.59       113.41       Grant.         —       Rubbers       —       —       —       4.49       50.41       Grant.         Gault       —       —       —       —       33.57       148.97       Grant.         —       —       —       —       —       29.10       149.62       Grant.         Wire-cut       —       —       —       —       31.67       157.49       Grant.         Stafford dressed Blue       —       —       —       60.02       441.47       Latham.	Unburnt Bricks	-	-	-	4.02	36.21	Grant.
Formed Red  Common Stock 1843.3 - 10.5 43.78 569.37 Latham.  Farcham Reds 1901.6 - 36.59 113.41 Grant.  Rubbers 1605.4 - 4.49 50.41 Grant.  Gault 53.57 148.97 Grant.  Wire-cut 29.10 149.62 Grant.  Pressed 31.67 157.49 Grant.  Stafford dressed Blue 60.02 441.47 Latham.	Common Red	1894.7	_	-	25.19	151.16	Latham.
Common Stock        1843.3       —       10.5       43.78       569.37       Latham.         Farcham Reds        1901.6       —       —       36.59       113.41       Grant.          Rubbers        1605.4       —       —       4.49       50.41       Grant.         Gault        —       —       33.57       148.97       Grant.          Wire-cut       —       —       —       29.10       149.62       Grant.          Pressed       —       —       —       31.67       157.49       Grant.         Stafford dressed Blue       —       —       —       60.02       441.47       Latham.         Stafford dressed Blue       —       —       —       60.02       12.12       Latham.		_	_	-	86.83	124.59	Latham.
Rubbers 1505.4 — 4.49 50.41 Grant.  Gault — — 53.57 148.97 Grant.  Wire-cut — — 29.10 149.62 Grant.  Pressed — — 31.67 157.49 Grant.  Stufford dressed Blue — — 60.02 441.47 Latham.		1843.3	-	10.5	43.78	560.37	Latham.
Gault 53.57 148.97 Grant.  Wire-cut 29.10 149.62 Grant.  Pressed 31.67 157.49 Grant.  Stufford dressed Blue 60.02 441.47 Latham.	Fareham Reds	1901.6	_	-	36.59	113,41	Grant.
Wire-cut 29.10 149.62 Grant.  Pressed 31.67 157.49 Grant.  Stafford dressed Blue 60.02 441.47 Latham.	Rubbers	1605.4	_	-	1.49	50.41	Grant.
" Pressed 31.67 157.49 Grant.  Stufford dressed Blue 60.02 441.47 Latham.	Gault	_	_	-	33.37	148.97	Grant.
Stafford dressed Blue 60.02 441.47 Latham.	Wire-cut	-	-	-	29.10	149.62	Grant.
Stationa dressed Patie	Pressed	_	-	_	31.67	157.49	Grant.
sc. 33   293, 19 Latham.	Stafford dressed Blue	-	-	-	60.02	441.47	Lathan.
20 20 20 20 20 20 20 20 20 20 20 20 20 2			-	-	80.33	293.12	Latham.
Common Blue 50.08 150.25 Latham.	Common Blue		-	-	50.08	150,23	Latham.
Bishops Waltham Wire-	Bishops Waltham Wire	-					
eut 124.74 189.09 Bramwell	ен		-	-	124.74	189.09	Bramwell.
Burham Wire-cut 1671.3 — 19.0 — 212.62 —	Burham Wire-cut	. 1671.	3 -	19.0	_	212.63	-
Pressed 1701.7 — 19.5 — 193.72 —	Proposition	. 1701.	7 -	19.5	-	193.7	2 -
Wiresent White Gault., 1645.2 - 19.0 - 212.62 -	Wire-ent White Gault		2 -	19.0	_	212.6	2 -

#### Appendix 17. .

Tableau de comparaison entre les prix de revient des planchers en bétan armé et planchers avec solivage en hois ou en fer.

Les calculs des planchers ont été faits en prévision d'une surcharge de 300 Kgs. par mètre carré et les prix de revient faits pour une bande de 1.00 mètre de largeur et de toute la portée de la pièce.

Les prix unitaires qui ont été appliqués pour établir les prix de revient sont :

1° Pour plancher composé de solives en bois, faux plancher et natte (Prix de l'entreprise de l'Ecole Sanieh).

2º Pour plancher composé de solives en fer entrevous en briques creuses à plat et béton de remplissage jusqu'au niveau de la semelle supérieure des solives (Prix de l'entreprise de l'Ecole de Droit).

3° Pour plancher en béton armé composé seulement du hourdis et de poutres pour les grandes portées (Prix de l'entreprise de la Caserne des Pompiers).

PORTÉE	SURFACE DE	PRIX I	E REVIENT DES PLAS	CHERS
E CI 40 S ESSE	PLANCHER	avec solives en lois.	user solives on fer.	en bêtan armê.
м.	M2	LuH. M.	1E. N.	L.E. M.
3	:}	0 762	0 832	1 500
4	\$	1 259	1 325	2 000
	· 3	1 961	2 023	2 500
t'i	6	2 857	3 264	3 000
7	7	3 450	4 565	4 620
8	8	4 072	6 192	5 280
9	9	6 131	8 602	5 940
10	10)	7 446	11 555	6 600
	52	28 538	38 358	31 440
Prix moyer	ı du M²	28,538 L.E.0.549 52	38.358 L.E.0.738	31.440 -52 L.E.O.605

# CAIRO VOIRIE

## CAIRO ROADS

Total area square metres	0.00 5.04	040 081	2,831,077	
Inferior macadam	200 000	\$40 070 \$4 050	\$0.M. 450,606 16.5% 15,562 974,870 34.5% 1,390,039 49.0%	100%
Earth reads	Total		2,831,077	E. E.
Spent in upkeep, square total at rate of 24.9 Mi Spent on asphalt roads on	Historica	444 444	roads or 17%	12,229 17,305

83% of the streets of Cairo are not maintained at all, owing to want of funds. The public complain that, though the progressive increase of the house-tax from 1895 to 1902 amounts to 41.5%, the budget for road maintenance has only received an addition of 3.86%.

The roads budget for Alexandria in 1903, with a population of 320,000,

amounted to L.E. 30,800.

Cairo, with a population of 570,000, can with difficulty devote L.E.14,000 annually to the same object. I am not taking into consideration the incidental grant of L.E. 20,000 for asphalt.

This latter grant only suffices for approximately two kilometres out of a total length of 283 kilometres of road.

Appendices C. P. E.

THE STATE OF THE PARTY OF THE P				Lists	
First cost construction	Rouds Trottoirs	***	000	684,035 221,345	LE. 905,380
Cost of annual repairs	Roads Trottoirs	0 0 0 A 0 0	100	67,235 11,865	79,100
Total cost of plant	107 409	500	105	0.00	15,000 999,480
n to a lambia				005 107	79,100
Real cost annual repairs Sum alloted 1904	904 000 000 804 000 040	***			16,000

#### TANZIM AND VOIRIE.

Appendices C. D. E. I would draw special attention to the statement showing the striking disparity between the funds allotted and required for road construction and maintenance. It is interesting to note that the Ghezireh Hotel Company charge householders on their estate an annual tax of 240 P.T. for scavenging and watering only, whereas, as estimated above, an additional house-tax of L.E. 2.610 Milliemes would provide funds to construct and maintain the whole road area of Cairo.

I have, as usual, reduced to a tabular form the result of the year's work.

Denomination of 2,189 nameplates for roads and roads and numbering of house. 3,358 house numbering plates were ordered in 1903. They will be fixed in 1904.

Appendix A. The Kasr-el-Nil Square and approaches and the Mariette road leading to the Museum were remodelled and considerably widened in 1903. The total cost came to L.E.1,739. Of this sum L.E. 1,000 was furnished by the Tramway Co. in consideration of a permit to lay a new line round the Mixed Tribunal and to double the track along the Mariette road.

#### RAIN DRAINS.

These have worked well. The upkeep of these drains costing L.E.735 has come as a new expense on our budget and, until a special grant is made, will cause a diminution in the area of road maintained.

The expenditure of the L.E. 735 is detailed as follows:-

Sewermen, maximum 30, minimum 11 : average of	L.E.
the year 21 per day, costing, night work included	352
Water-cart for removing water from decandation	12
Carte for against the property	148
Supervision	43 98
	50
Electricity 810 kilowatts × 0,038575=	31
Totul I	E. 735

The work executed comprises:

Removal of dirty water from the drain mouths	155	
"funtasses"		2354
Removal of mud from the drains and mouths		(1-)7
Water numbed		E 9 2 841
Time for pumping this water		4114U
Placinisty opposited by the mater		45 hours
Electricity consumed by the motor pump		810kilowatta

In the above volume of 51,140 cubic metres of water pumped are included:—

The price of water for (a) and (b) has been paid by the Sanitary Department and (c) by Tanzim Service.

The water at the mouths was removed by buckets.

A project for providing a further zone in Cairo with rain drainage at an estimate cost of L.E. 115,000 was prepared in this Office and submitted to the Sanitary Department on the 28th June 1903. No decision has as yet been arrived at. I would point out that a post-ponement of this question implies the adjournment of any further extension for the asphalting of the native quarters, as streets cannot usefully be asphalted until they are drained. I am anxious that this fact should not be overlooked.

## ARAB MUSEUM.

A small garden was laid out at the south angle of this building at a cost of L.E. 214 to prevent dust from rising into the Library windows.

# EGYPTIAN MUSEUM GARDEN.

The laying out of this garden was completed in 1903 for a sum of L.E. 1,093, of which L.E. 590 represents filling and supply of vegetable earth.

The water installation comprising hydrants, cast iron and lead pipes accounted for L.E. 570.

# CART SERVICE.

Fair progress has been made with the demolition and reconstruction of the old Tanzim Cart Service stables and offices.

L.E. 2,450 were spent on offices, stores, dépôts, etc.

In spite of bad foundations necessitating the use of short piles the rate per square metre for stores and offices only came to L.E. 5.431 and that for dépôts to L.E. 1.812.

#### ASPHALT STREETS.

Out of a grant of L.E.20,000, a sum of L.E.17,599 was spent on the asphalting of 15,562 square metres of street. The rate per square metre for asphalting alone, including maintenance for 20 years, is L.E. 1.

The extra 0.115 per square metre represents kerbing, kennelling, drain junctions, unforeseen work and supervision.

The cost of the best macadam, not including kerbing, etc., amounts on 20 years to L.E. 1.165 per square metre or L.E. 0.050 more than asphalt.

This represents on 20,000 square metres the area which it is proposed to asphalt annually, an economy of L.E. 1,000.

The Neuchatel Asphalt Co. have so far fulfilled their contract engagements expeditiously and loyally.

After placing every possible obstacle in the way of the contractor even going so far at to assault the workmen and defacing the freshly laid concrete, the public has hailed the accomplishment of the new roads with enthusiasm and petitions are being signed praying for considerable extensions.

I would draw special attention to the great assistance furnished by Mansfield Pasha, of the Police, and his assistants.

Without Police protection the work must have been stopped.

By the employment of a few thousand pounds on expropriation, sections of existing streets running in the same direction, but blocked by intervening buildings, could be coupled up and converted into main lines of traffic. No funds are granted for this purpose. Every year expropriation becomes more costly. I presume that in case of a severe epidemic in Cairo, the piercing of wide thoroughfares would form part of any extraordinary scheme of hygienic legislation. Under such circumstances economy could not be practised. By the expenditure of an annual sum under conditions permitting of careful estimation and leisurely bargaining, large economies could undoubtedly be effected.

# STATEMENT SHOWING ROADS ASPHALTED IN 1903.

	N	AME 0	r Roai	bs.					AREA.
									76.2°
Bab-el-Bahr, Souk-	-l-Kao	chab,	Souk-	el-Zal	at, Kl	urrut	ine.		6314:40
Bein-el-Harat		047	0 0 0		***	• • •	0 0 0	3 0 0	1985-67
Darb-el-Boughdady el-Khadra	, Dar	l-e-1-V	Vassel	n. Châ	k-el-T	léebai	ne, H	WL64	1610-77
El-Kobeleh	***	4 0 0		***	8.0.0	***			1721.18
Fountyeh-Roney	***		<b>u</b> o d	H 0 0					2666.62
Sekket-el-Roney.	***	***	***	4 8 4	***		P # th	***	757:12
El-Borg	***			* * *				***	505185
					Tot	ai		•••	15561-61

## GUEZIREH GROTTO.

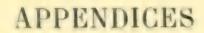
#### RECEIPTS.

478	Paying tickets a	ıt		0 10 4	0 4 4			L.E. 23	
6480	Paying tickets a	ıt			100	., ()	()2()=	., 129	DOME
208	Service								
TOb	" Abounement"	1	***		944	()	AND SERVICE	., 1	(Sext)
	Sale of 8 ticket	books	HT.	4 4 4				-	
7275					Total			L.E.155	1410
1 100 1 10									

# Comparison of Similar month 1902-03: 21st November to 31st December.

		Finds	1903		
	N-	Amount	N"	Amount.	
		1, FL . M .		L.E. M.	
Paying tiekets at L.E.O (50)	. 45	2 250	7.6	2 9(0)	
Paying tickets at 0 020	. 505	10 E00	536	10 720	
Free	. 14	-	17	_	
Total	364	12 350	611	I3 620	







# A.—TANZIM ROEHSAS DELIVERED IN 1903 & 1902.

		ilding=		upation e reads.	Fren Venn	unlahs.	Totals.	Racures.
YRAIS	Caires.	Kombbeh and Matarich	Cairo.	Kouldah and Matarich	Спио.	Koubbeh and Matarich		
								fE. M.
1903	2,251	8	166		107	_	2,532	1.458 457
1902	2.181	5	123	-	62	_	2,361	1,023 772

# B .- Expropriation and Sale of Ziadet Tanzim.

	Exi	PROPRIATIONS		7.1	ADETS SOLD.	
YRABS.	Araun.	Sums paid.	Price of M2.	Arena.	Sums received.	Price of M <sup>2</sup> .
1903	1,696.24	1,106.815 999.452	0.652	1.252.36 685.47	923.361 401.528	0.737

C .- ESTIMATE COST CONSTRUCTION AND MAINTENANCE OF TOTAL ROAD AREA CAIRD.

		Total pres for which Tanz is responsible	Total group for which Janua in a majorathic	Por	Ares at pressitt	promitti		Uniones sequisting	equistant	that of paying Non a said D.		Chet auntal maintre-	-	Conf. plats!	Ne. of Your
Cave	Carminur	N. W	OLI COMP	Catholica			111111111111111111111111111111111111111					Now Ountern	old town	Maradum	(An
		Maradulli	Aspetisti	Total	Mansiener. Asplinit.	Asplinit.		Macadam Aspladi		Martifold. Asjellall.		M.cornelister	Asplauli.	11	10
		24	22				-						The state of		
1st Cat	1st Cutegory	SWILL SWILL	a 21, 02,	thirth, thirth	Anti-OM	31. Nu	12, 101	hett., 118	IIN SHE	E. SKE	9,880 138, her		T. Mer Sin Yours	3.0.4HR1	E e e
THIS I	. E			3181,000	×	×	36	THE PRINT	214,000	70.0KH	046,040	100 m	:	4	÷
3rd		Jan. shus	W. 6240	107,480	ж	ж	16	LIME, IMIL	97, 03M1	Str. OHR	167 42348	18 17 18	-		
124	0 V		11.3.14	241.870	×	×	×	160,080	41,970	SS THE	18. E.	III SABI	-		1
	4 4	ERMO, CRIME	550, OBB	1,150,000	×	к	36	GRU, CRRE	GREE, CRIEF SORT, CHRIS	SHO, OHO	×	10,220	*		
*										5.15	1881 S.	79. Jens		[5-1HB]	19
	e i Killi	total	7.6								-				
		2 i	9,835,1400							1E. 1005 3744	1997				

# RECAPITULATION

905,380	\$ 79.10c	15.CHM)	INDER BEIN	
221.3.6	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	10,000	Total Late, 1980, 1901	I.E. 36,000
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		:	otal L.16.	~
Ronds Sidawnlks	Stdewnite 11,345	Total saint plant	<del>,</del>	251,0000
-	~			L.I.
Total conficultation	Trein root annual maintenance	1		
· · · · · · · · · · · · · · · · · · ·	san intellul	ф 15		r Maintens r Aspladt
H cunstru	of annual	at plant		* * Fo
Tricks or a	Trefat von	Nodes 1418		N. RFor 1994 the Konds Budget equals \$ h) For Asphall 1
				r Bands Bu
				or 1906 th
				1 = 2.

D.-ESTIMATED TAN BEQUIRED TO COVER IST COST & MAINTEMANCE OF CAIRO ROADS.

		1,393		200	1.21		2,610		1.217	
	$\frac{905,380}{10}:\ 60,000=0,151$	905,380 : 65,000=		79,100 : 600,000)=0,132	79,100 : 65,000=	0,283		0.132		
	905,380	905,380		79,110	79,100					
		*		*	:		:			a a a
65,000	A.—Annual construction charge per head population	:			*	0 0	4 4 2		*	0 0
-	40 0 0	d d		# #	*	*			*	
* *		6 6	MH.	**	*	head	hous		•	* * * * * * * * * * * * * * * * * * * *
* * * * * * * * * * * * * * * * * * *	:	0 0	(HVI	•	•		THIL			
A.—Population	0		ANNUAL MAINTINANCE CHARGE.	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0	Total per head	Total per house		# # # # # # # # # # # # # # # # # # #	0 0 0
er of:	*		STITES	:	0 8 0			1	* *	
- dumi		0	. M.	:				to		
nute I	ulutio	* * * * * * * * * * * * * * * * * * * *	SSUA	0 0 0				N.BAt the end of 10 years the charge will be reduced to:-	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 4
ulatio	holi		V		*			er re		
Pop-	limil	101180						will 1		0 0 0
A.	IMI	part			* * *			OH.		*
	arge	41		0 0	6 6 8			e che	0 0	•
	in ch	1		ion	:			rs th	•	
	ructio	rueti		pulat	:			D year	0 0	:
	somete	COLLEGE		od p	, and			l of 1		99
		naul		· hea	noll.			in em	i hen	noq :
	-Am	B.—Annual construction clurge per house		A.—Iter head population	B.—Per house			Ar th	A.—Per hemil.	B.—Per house
	-	13		-	B.			B.—	N. W.	B.
								Z		

In London and Paris these charges amount to approx. : 0,450 per head and per annum.

						SUDIMA	ISION OI	ľ	PAVED B	941A0					Total area		
		Erm	e Store R	OADS		SUBDIV	BARALT		Roans		Ronds its	mapressud (	k " Briquette	es " Asplinit.	of Bends	Total	Total area
YEARS	Bud Roads old system.	New li	Newly	Total.	Totals of Roarts in bail	Had Bonds old system recon- structed in basalt.	Previously in ourth recuistructed in baself.		Newly made in besalt.	Total.	irreviously in mucadata and recon- structed in com- pressed asphalt.	Previously in earth and recon- structed in com- pressed asphalt.	In asphalt com- pressed briggettes	Total	in different systems of paving.	of earth Reads.	Cairo Ronds.
			111	10		VII	VII	ı	VIII	17	Z	XI	Z11	ZIII	XIV	XV	IVX.
To and of December 1992	858,930,27	86,657,39							-	874,692,78	-	-	6,482,00	6,482 jess	L,400,835.87	1,128,187,65	2,524,524,22
In 1903	77R.145.25	2.577.25 to destrict from cot XV	6,910,91	9,517,19	-	81,597,00	to deduct from		43,910,90	95,691,51		13,953,64 to deduct from col XV.	-	13,161,61	97,5A×.32	16,678,38	-
Deduct Roads in briquettes recon- structed in localt	_	_	_	_	_	_	- 1	h	-	_		-	2,400,00		-	-	-
Add newly made Homes (Col. III and VIII to total area of Cairo Roads		_	-	-	_	_	_	ı	-	-	-		-	-	_	-	20,889,94
Total to end of December 1908	778,146,00	×9,234,701	SD,493_00	169.727,00	917,873,00	456,289,0	117.00		13,950.00	470,387,00	1,907.00	13,958.(H)	4,082,00	19,643,460	1,137,993,00	1,406,509,00	2,844,413.00
Percentage	-14 51,1	74. 6,2	5.6	% 01.8	(% 65,9	34.7	90 0.01		% 1.0	% 32.7	7.0	3.6	0,3	1.3	Too		
	-	-	_	-	-	-	-		-		-	-	-	-	96,5	49.5	96

F .- REPAIRS BY HAND-LABOUR.

Abourers. Carle and Carle Total	Sum. Days. Sum. Days. Sum.	5 643 2,887 156 3,127 421 2,338	5 649 2,814 165 3,574 494 2,622
La	f. Sum. Days.	1,118 12,545	6 1,314 12,915
Material.	Stone. Sami, Waler.	7,917 2,134 2,494	8,120 2,130 2,546
Area	numined	248.052	×11-,010
	Year.	19403	2001

1902.	0.033 0.238 0.314 0.010 19. 03 87. 33 27.882 4.164 0.0054 0.0050 0.0020
1903.	7,917; 248,052= 0.032 2,134; 7,317= 0.270 2,494; 7,917= 0.215 2,494; 248,052= 0.010 248,052; 12,545=19.77 248,052; 12,545=19.77 248,052; 12,545=19.77 1,118; 248,052= 0.0026 1,118; 248,052= 0.0026 1,56; 248,052= 0.0026 1,56; 248,052= 0.0026 1,56; 248,052= 0.0026 1,56; 248,052= 0.0026 1,56; 248,052= 0.0026
	HIII HIII HIII
	i i j
	tone done paire and serve rep
BEPAIRS FIR HAMP-LABOUR.	
MP-L	it is a second and
HA	Depth stone per square metre
A PIER	er square mused per cubsused per cubsused per cubsepaired per squarery per caparted capart
AIR	of sand per culter used per culter used per culter used per square per ce repaired per ca watered per transported per transported per per journey of maferials per per labourer
REI	of sand per squi of sand per used per used per repaire ce watere transported per jour ser jakour eer sakkur eer cart
	of the period of
	ston from from arrival and a ston mrfam arrival and a stone and a
	Depth stone per square Cabe of water used per citche of water used per stone of water used per stone of water used per stone surface watered per Mean surface watered per Mean cube transported per Mean cube transported per Cost price of materials per labourer  per sakkus and
II.	는 하는

# G.-PERCENTAGE TARLE.

	Material,		LABOTTE	UR.		1
YEAR.	ennel, warer	Men.	Saklas & Fanlase %	Charles	Total 96	por ms.
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	47°8 50°1	51 51 15 %	63	18.0 18.8	52°2	0.6094 0.0107

H.-STEAM ROLLER REPAIRS.

Tora1.	3HWOHW	Table.	871
Rolling.	Sum.	Fig.	1.85
Sugar Roller.	Days.	22	7.
Curta.	Sum.	1.8.1	7-
Ch	Глув.	1,005	120
Fantaus.	Sum.	1.E.	
Fun	Buys.	1386	115
allmin.	Rum.	162	9.
le.l	Dayn.	2,763	3.130
	shin.	513	287
Material.	Water.	XXE	Z.
Mat	Hand.	988	565
	Stone.	3,029	21
Parents freed	nue.	26,170	31.180
	YEAR	1963	1995

CHAI	0.11.0	25%-0	0.032	91.6	271.73	2007	2.012	330734	PERMIT.	U-028
		3,022= 0.293	170= 0.03H	2,765= 9.46	138   186 cm	1,005= 33341	6,782= 3:530	70= 373586	86,170= O'410.BG	6,170= 0.037
3.022:	386:	325	S.S.G.	26,170;	26,170;	3,408:	7	26,170;	24:	S. 1634: 2
	on his metre of stante.	cultie une cel atome	square metre repaired	ner day of workings.	or day of families			Chry of steams rolled		r square metre of repair
Sent is a fenter from some sent	Promouting of contract	The second second second second	the of water used ner	Main sulfited repusited	Called September 30 12 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Ments colder fruits Torrest	and of curt mer fourthe	Man anriace rolled not	Takin myang casal labare (3	Total mean cost price pe
-			+	17	1	1	9	0	10.	11.

# J.-BASALT REPAIRS.

	201111111111111111111111111111111111111		Mon		Fantass	Alass	Chirtis	55	Statin roller.	Per Hant.	Kilome	Kilometre tems	T. Am
ding. Water	ber.	sum.	Duya.	Ann.	Days.	N. E. E.	lays.	S. E.	Days.	Sum.	per Mr od Fouth,	per Ma of material,	Amount.
CM. C.	6,691 1,856	2,344	21,555	1.24% 963	SSC	12 E	5,13 612,6	4 8 6	1975	258	0.912	9-882 10-708	5.220 3,883
stene, of water of wa	per M materi r used r used repair water masjor per jou realled	in of age in of age in of age in of age in of a per cod per cod per cod per cod per cod in a per ding a per ding a per M	1. Depth stone, per M*.  2. Proportion of unterial of urger egution per M* of stone 3. Cabe of water used per M* of stone 4. Cabe of water used per M* repaired 5. Mean surface repaired per day of workman	i per M" orkimu mrass nurt m rolle	of stome	14,517 1,735 6,691 171,803 171,803 16,252 171,803 171,803 171,803 692 2,220	न सम्बद्धाः ४७ स्ट		0.085 0.085		1942. 0*0.082 0*1.30 0*0.404 7.50 7.50 7.50 3.4.71 3.4.71 3.4.71 3.4.71 3.4.71 3.4.71 0*0.046 0*0.032		

# K.-PERCENTAGE TABLE.

	per Ms	0.0304
	Stenau roller 96	1333
	Total %	4178 3779
MIR.	Carts 96	14.7
LABOUR	Puntuse 96	÷1 ÷1
	Men.	1- X-15:
Minterial,	binding water.	17.2
	YEAR	1903

L.-ROADS RECONSTRUCTED IN BASALT.

.841	nitia	Total expan	4,766	4,0.12													
Cilota.		·K. w. ]	. 18th	7. 828 838													
Tung Kilona		Free Transf.	1,169	1.23													
<u> </u>		Juneurk	25	41.0													
Raller		ાહાલાયુર	1 - 	H 25													
15 SBS8R	lern ring	ar hua	3	75	1.H12	O-152	11-4183	II-IPER	日本 日	9.541	以上	D-13827	040181	0-0114	[ (KD4)	0.00029	0.000
		Janourk	35 1- 1- 1- 1- 1-	12 12 12 12 12 12 12 12 12 12 12 12 12 1			=	= 1	53	43	7	246	-	3	-	0 4	2 2
Labour and		दशक्षी	15,258	11.5492		0-101	0.300	11-053	Impol	XX THE	4. N. S. S.	0.027×	DOM:	0.0125	11001	0-0000	HUSS
£.		Janoury	10 20	36			11	11 3			0.0	No.	[]	11	n i	1 1	
Water.		адајт	4,814	8,487	1918	81,397 ==		M1,507 ==			1,070	90	K1,697			100,10	
1) 886.		Amounh	# SI	4		1,750:	4,814:	4.814:	81,097:	19,47R:	124	2,2114:	875	1.0233	1111	1000	4,7464:
Funtass.	-	EqaCl	100 100 100	10 10 10		-	1		000		i	0 "	1	7	7	:	1 1
		hnomk	1,0,23	13.50		1			1		-			1 1 1	0.71		: :
Hirle		-siq1	2,000	4.287			:			60.4	-		:		7,000	100	
tient hy	7 7 7 7	Jan.T	12,653	10,745		: 4	•		ILBS		:		-	*	* * * * * * * * * * * * * * * * * * * *		: :
Work performed by curte	transported.	to drail.	20	<u> </u>		return per M? Main stone	atona	FIMICE	entrice per may as insperies			No.		*	water	BINE	1 :
Work	Muterials 11	-anthuitt	1.7.5%	1-		ner Ma	of water used per Me of stone	of water unad per Me of rimul	anther watered her day of far				HEE	: '	la l	District.	:
	Muse	Hraniti	9,365	12 % 12 %	34 34	M	tand hor	and pass	akered 1	on ho transported	of earl per jearling	cost price material per	workinns	enrie	figurage mud	sulfant s	price
		Junourk	50	1,018		h stone per M'	Water L	willer (	rince pe	the trum	ad has	of pries		-1-	:	10	menn cest pidee
rinl.		Binding	40	1.7.1		Property at			Menn su		_	Month Po		2	:	4.6	Totall an
Material	-	sweps MO	80	183		si		7		2-	zi :	10. 3		120	e :		
		Manuil	9,367	Tarie Sura													
	,	Area.	H1.607		o Labrana albe,												
		Y EAR.	TONS	1002	· Len												

N .- NEW ROADS ROLLED BY STRAM ROLLER.

		Mark	Material.		Lul	Глімпіт.	J'un	Puninse	(3)	Carth.	SUINT.	2042.	Lotul
YEAR. Area.	- St.	Sand.	Water.	Ammut.	Days	Amount.	Days.	Ammint.	IMINE	Days. Amount.	Days.	Days. Amount.	Amount.
				2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		E.E.		I.E.		Les II.		La.R.	of the second se
1943 23,615		110	1,473	1,052	-	200	191:	21	1.501		15:	133	1.723
	100	5,508											
1902 21,725	1.310	?T	2000	\$. <del>1</del> .6.	F.104	21	2000	=	1,182	101	121	120	1,515
	5,0	5,082											
							_		1003		TS NO.		
	Mean	enth sto	M. Ink.	Mean depth stone per square more		0 0 0	+	4,836: 23,615=		0.240	OFFICE	0	
		ion of	annd met	Propertion of sand ner cubic metre of stone	=	»folle		672: 4,83ti=		0.139	1111	1	
1 67	3. Culm of	water	nsed her	The of water used per cubic metre of some	setre of	-(0)]11		1,475: 4,836=		0.305	0.512	21	
, ¬		Willer I	Head part	hand he of the sent the tree is a first	melle u	f road		1,475: 23,615=		0.062	(F)	71	
100	Mean	irface p	er day	surface per day of worknum	111111	•	?i	23,615: 4,747=		1.05	2.50		
	Mean	Hitace w	valered	SHEIRCE WHIEFER INT CAY OF FABRIES	of fants	N. N	23.	23,615:	196=12048	ST.O.	17.36		
2	Nean e	nin tru	Isported	cube transported per day of curt	of curt	004 490		5,508: 1,1	1,561-	35058	H-13(H)	0	
· 7.	S. Lond of	cart m	r journe	Lound of carr per journey	p 6 8	D D D	7 7	24: 74	7.056=	3423	2.791	1	
G.	Menn	arface r	olled pe	surface rolled per day of seam roller	Strain 1	asilter.		23,615; 131=18026	2 = 121	0.26	176'62	•	
11	Menn	ost price	cost price per roller	lier	0 0 2 0 0 0		100	133: 23:615=		0.0000	0.0055	-	
11.	Total	ed price	per sur	-	1,61	6 0 4	1,	1,723: 23,615=		0.073	020.0	2	

P.-LEVELLING OF EARTH ROADS AND FOOTPATHS.

	Lavelling.	Hing.	Workin	Working days.	Pluye	Imps curts	Days watering by hand.	of hy hand.	Cube a	Cube of surth.	Ame	Amounts,
YBAB.	Equals.	Fuotpaths.	Rouds.	Footpuths.	Raiselm.	Footpatlia.	Bunds.	Pentpaths.	Brought.	Transported.	Rennis.	Footpaths.
1903	424,022	65,095	1.275	***	1- 17	113	56	10	9.199	3,284	386	<u>e</u>
	489,117	1117	1	1,598	3	199	3		5,413	8:2		135
1902	305,200	156,83	7.50 67	1. S. C.	7	181	16	1-	Seis.	1,327	141	86
	375,217	[-	1	1,306	5	S.C.	÷	~	est.	6.65	, .	334
	38989838 88	(a) Cost price, levelling rea (b) " " food (c) Area levelled per day a (d) " " per fanta (e) " per fanta (f) " " (h) To deduct from total sa sakka and fantass (i) Average pay of workm (k) Cabe detritus removed	Cost price, levelling reads  Area levelled per day and  " per fantuss " per fantuss " Average cube carted per cank and fantass  Average pay of workman Cube detritus removed	and me as and me	quare metres in, roads footpaths askka, road foot	etres idhs footpaths id for carts,	312. 13. 14.694. 8.685. 5.413. 3.284.	392; 424,022= 0100 43; 65,095= 0°00 022; 4275= 99°18 095; 323=201°53 694; 56=262°39 685; 10=868°50 413; 666= 8°12 413; 666= 8°12 435- 97=338 338; 4,598= 0°07 284- 2,129= 1°15	922= 010009 935= 010009 935= 9913 323=201.53 56= 26239 10=868.50 97=338 97=338 129= 1.155	1002. 0°0014 0°0014 0°0018 387°37 538°28 1°704 383 0°089 3°959	п	

# Q.—REPAIRS OF KERBS.

-		Kerts.			Ma	tertal	1			Daily I	n la outr		S'a	rt ·	
Y EAR.	Total begild.	Ford buyth	alvm.	1,11190.	sund.	it-ura and tement.	Water.	* 1915,	Massed),	Flore Titler.	Labour D.	%um	I va v n	sun.	Testal.
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										1903		1:	и12		
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# S.-QUARRIES.

MATERIAL.	Tourah and Old Cains.	Abbassich.	Alwa Zantat,	Total_	Sand, Abbussish.
	7E 3	M	213	Mı	MI
1903. Road metal and sand	 3,197	8,624	21,827	33,648	12,220
1902	 2,695	7,542	16,278	20,515	8,010

# NEW BRIDGES ACROSS THE NILE

By your orders a very rough estimate of a bridge across the Nile had been prepared by M. Reboul in 1902.

During your absence in the Sudan Sir Eldon Gorst requested me

to complete this project.

The river section chosen was approved by the Inspector General of Irrigation as fulfilling the conditions of a permanent and settled direction of flow.

A sketch showing the position of the main and subsidiary bridges is attached.

The work of triangulation and survey necessary for measuring the areas to be expropriated was begun in April and May. Soundings of the main river and Roda branch were taken at the same time.

The specification was based on that in use at the Railway Department, but considerable modifications were introduced. We are indebted to M. Husson, of the Railway Department, and M. Holt, Vice Principal of the Polytechnic School, for advice and assistance. The entire specification was translated into English introducing English standard weights measures. The French original was finally submitted to Mr. de Rocca Serra, and the English to M. Brunyate. The complete classification of clauses is due to M. Brunyate. Mr. Clifton concluded all preliminaries after my departure for Europe.

The whole of the documents were approved by you on the 7th July and tenders invited in the Official Journal on the 21st of the same month. Copies of the specification were sent to France, England, United States of America, Austria, Belgium, Switzerland, Italy and

Germany.

February 1st, 1904 was fixed as the latest date for sending in offers.

A preliminary project showing proposed type of bridge was prepared by M. Zarzecki, of Mr. Reboul's Office. This project was brought to a stage of completion which enabled a close estimate of the probable cost of the bridge to be prepared.

Owing to the skill and energy of Mr. Reboul and the assistance of Abdel Halim Pasha, Director General of Wakfs, the usually interminable negociations for transfer of the land required for roads were brought to a successful termination in about six months.

The mean price paid per acre was L.E. 300.

The following data were taken as a basis for the preparation of the project:

Waterway	Main	Nile R.L. branch	21.13=					5725 533
Maximum				Testa	1	 	M:	6258

Smaller bridges,		Man New bridge	Kosr-el-Nil
83 Old Cuire 67 Kasr-el-Aini }	R.L. Road way Bottom boom Clear H. bottom boom above H.F.L. Length bridge M. Opening span R.L. bed now	22,20 1.07 535	23.80 22.20 1.07 406 one of 23.73 +1

The original estimate was as follows:-

Main bridge steel.

Length.	Width.	Arm	Weight S4, M. Kg.	Tielle
(335 ×	20)=	10700≥	:40=	35.75
Steel 3638 T Piers and ab	ons × L.E.17.5=		L.l	ASO OUR

# Small bridges steel.

Length.		idth.			Arm	t,			Kg.
(83+67)×		15			225()	×			340
Tons 765 × L.E.1	7.5=	•••		770			-	L.E.	13,388
Piers and abutm	ents							0 40 8 44	12,000
Main bridge	rintil wa	y and jo	al mei	ths.				L.E.	149,053
M <sup>2</sup> 10700 × L.E.	1.5	*** ***	***		111			LE.	16,050
Small bridge	es us abo	1160							
M <sup>2</sup> 2250 × L.E.	1.5		0 2 0	0 = 0	400	•••		L.E.	3,375
								L.E.	168,478
Filling for road	from L	L. 18 to	21:50	)=	***	0		0.5	11,200
Expropriation	*** ***		***		> 0 4	044	204	11	17,000
Macadam and k	erb					* * *		4.0	7,892
Retaining walls	*** ***					***		99	558
Staff	***	441 #40	***	200	899	**1		44	4,600
Unforeseen	100 000		0.00		2 0 0	Ane	966		20,272

The revised estimate reduces the amount for expropriation by L.E.8,812. The value of the bridge proper was increased by a similar amount, that is to L.E.177,290.

The R.L. of the lower boom of the main bridge girders is fixed at 2250 or M. 1.07 above R.L. 21.13 which is assumed as the H.F.L. at Roda.

The crest of the avenues of Roda island which will be about 2 <sup>1</sup>/<sub>2</sub> kilom, in length is fixed at 21.50, an average height of 3.50 above the present level.

It is proposed to give these avenues a width of 25 metres.

The work of the following engineers attached to Mr. Reboul's Office merits special mention:

Mr. Zarzecki.

- ., Schoechlin.
- ., Ricordi
- .. Ahmet Omar.



# CART SERVICE

#### ESTABLISHMENT.

The Cart Service commenced the year with an establishment of 118 animals and finished with 119—an increase of 1 mule.

11 mules were purchased through the Veterinary Department to replace the wastage which was as follows:—

# HEALTH.

The daily percentage of animals sick and under treatment was 2.8 of which 1.3 was due to accidents during work. These figures are even more satisfactory than those of 1902.

#### TRANSPORT.

The installation of a Decauville line at the Abbassieh quarries has greatly facilitated transport and prevented the overdriving of mules.

The great distance of the stone and sand quarries from the city and consequent higher rate of transport is a considerable factor in increasing the cost of the making and upkeep of the roads.

After another year's experience of the relative merits of the large double-wagon and small single cart for transporting stone and sand in Cairo, the conclusion we have arrived at gives the preference to the small carts.

#### Cost.

The average daily cost of P.T. 14 per animal, including cart, driver stabling repairs, etc., etc., has been maintained against the outside charges of 23 to 25 P.T.

#### SHOEING.

The system introduced from the commencement of 1903 of the Service shocing its own animals has given unqualified satisfaction.

The monthly cost of shoeing, including wages, material, depreciation of tools, etc. worked out at P.T. 5 per animal, or 120%, cheaper than in 1902, when we paid the Veterinary Department 11 P.T. per animal.

The Service has gained most from the fact that the shoeing is now done after the day's work, thus permitting the animals to go straight to work in the mornings; whereas formerly, the best part of the working day was lost owing to the animals being shod in the mornings. Each animal has its special day in the month for shoeing and on that day whether the old shoes are good or not the animal's feet are trimmed and new shoes are fitted.

As a result there is not a mule in the Service with an unsound foot.

#### REPAIRS.

After exercising the strictest economy it has been found that for the maintenance of carts and harness in a condition creditable to a Government Service the yearly repairs in perpetuity would cost as follows:—

Carts L.E. 4.430 Milliemes or 30 to  $40^{\circ}/_{\circ}$  of cost price Harness ... 1.500 ... or 25 to  $30^{\circ}/_{\circ}$  ... ...

The wear and tear on a stone cart is of course heavier than that on any other.

#### RECEIPTS.

The receipts for work done, stores supplied, animals hired, etc., to outside Services amounted to L.E. 1,178.

#### ESTABLISHMENT.

As stated in 1902, the number of animals now in the Service is not sufficient to transport all the material necessary for road-making and repairs and, in consequence, a portion of the transport is done by outside contractors at a price from 30 to 40°/o higher than it could be done by the Service Carts.

At least 20 more animals are necessary. The initial cost would be about (25> 20)=L.E. 500, and the yearly cost of maintenance would be L.E. 1,000.

## STABLING.

There is only proper stabling accommodation for 60, or half of the available animals. We are obliged to keep the remaining animals in the open without shelter. The animals are also too closely packed and there are frequent accidents to syces in consequence. Stables are being built out of current funds, that is by degrees.

# STAFF.

Mr. Pothecary, the Stablemaster, merits high commendation for the excellent way in which he carries out his duties.

COMPA	RISON OF	COST OF	FORAGE:	5 YEARS.
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FORAGE.	fer ton. 1890-1900	Per ton 1900-1901	Per ton. 1901-1902	Per ton. 1902-1003	Per ton 1903-1904	
	tK. M.	L.E. M.	LE M.	L.R. M.	1k. M.	
Beans	5 102	6 360	6 087	6 717	6 855	
Barley	. 5 079	5 850	5 390	5 807	5 928	
Tiblán	1 642	2 370	1 896	1 163	2 320	
Bran	3 898	4 000	1 320	1 783	4 676	

W OF YEARLY INCREAST ON COMPARISON WITH 1899-1900.

FURAGE.	Fer ton. 1899-1900	Per ton. 1900-1901	Fer ton. 1901-1902	Per ton. 1903-1903	For ton. 1903-1904	
P ORGANIS.	A	Increase on A	In rease on A	Increase on A	furniuse an	
	L.E. M	1/4	14	64	96	
Beans	5,402	17.7	12.6	21:3	26.8	
Barley	5,069	15.4	63.13	14.5	16.9	
Tiblin	1.642	44.2	15:4	19.5	41+2	
Bran	3,898	2.6	10.8	22.7	20.00	

# PUBLIC LIGHTING, 1903.

# BUDGET.

No addition was made to the Budget for public lighting during 1903 and consequently there has been no increase in the number of lamps.

# REQUIREMENTS.

As stated in last year's report 6,500 more lamps are urgently required. The approximate annual cost at existing rate would be L.E. 43,500.

## INCANDESCENT LIGHTING.

As forecast in 1902 the Gas Company have consented to introduce incandescent burners at their own expense for public lighting to replace the old flat-flame burners. As with this burner an intensity equivalent to or higher than the contract minimum can be produced by the consumption of 80 litres of gas the Company can set an economy of (140—80)=60 litres per lamp against the higher cost represented by wear and tear of mantles. The Company probably gain about L.E. 3,000 per annum by this change.

The work of changing the burners commenced in October, and at the end of the year about 500 lamps were incandescent.

There can be no question as to the result; it is very satisfactory and is a great advance on the old system.

#### FINES.

The fines levied on the Gas Company during 1903 for lamps giving defective light show a decrease of about 50%, on 1902. This is due in part to the greater attention given to repairs, &c., but mainly to the improvement in the quality of gas supplied since the introduction of a testing laboratory under the very able guidance of Mr. Lucas. Heavy fines (L.E. 441) were inflicted on the Company for bad quality gas.

A comparison of the number of lamps reported as defective is interesting in 1902 and 1903.

	Lamps extinguished.	Lamps giving less than standard flame.
1902	586	43,800
1903	512	10,417
Decreuse	74 or 125%	33,383 or 76%

The rules at present in force are as follows :-

- 1. For a lamp found extinguished a fine is at once inflicted.
- 2. For a lamp giving less than the standard flame it is reported to the Company and if on the following night it is still defective a fine is inflicted for both nights.

## LUNAR PERIOD.

Under article 16 of the contract one fifth of the total lamps are unlit during the lunar period, or 10 nights in each month. Of course the Company receive no payment for these lamps.

Various complaints have been received with regard to this regulation, and public lighting would be distinctly improved if, during at least 5 months (October to February), the above quoted article could be suspended. This measure would entail an extra expenditure of L.E.135 monthly, or for the 5 months L.E. 675. As the Service has no reserve fund a special grant would be required from the Finance.

The average rate of additional lamps installed would also be augmented from L.E. 6.701 Milliemes per annum to L.E. 6.925 Milliemes per annum each.

#### STAFF.

Mr. Mégalogéni has carried out his duties in a very efficient manner.

## GAS TESTING

# and introduction of electric public lighting.

#### FINES

The increase of fines consequent on the introduction of scientific testing initiated by Mr. Lucas evidently created suspicion in the minds of the Cairo representatives of the Gas Company. They impugned the accuracy of Mr. Lucas' tests and asked permission to bring from Paris a gas expert to check our apparatus and methods. This permission was at once granted. In due course M. Couderchon, an expert of repute, arrived. His report and Mr. Lucas' reply are attached. It is evident from a perusal of the two that the accuracy of Mr. Lucas' methods is fully established.

The vexed question of the interpretation of certain clauses in the gas contract has again been raised. Startling anomalies at present obtain in Cairo.

We may accept as an axiom that gas is cheaper than electricity.

In Cairo a gas lamp of 12 c.p. costs per annum L.E.6.701.

In Helwan and other towns of Egypt an electric lamp of 20 c.p. costs from L.E.2·25 to L.E.3 per annum.

In contradistinction to accepted practice electricity in Cairo would, therefore, appear to be much cheaper than gas.

We have asked the Company, either to reduce the price of gas to say 260 P.T. per lamp, or to indroduce public electric lighting at a rate similar to that charged by Concessionnaires in Egypt.

They have refused both requests.

A scheme carefully worked out by Mr. Jacot, Government electrician, proves that by erecting and working its own station Government could furnish electric lighting at L.E.2,60 per lamp of 32 c.p. on the 6,000 lamps required; this equals a saving of L.E.4·101 per lamp and per annum compared to the present price.

# REPORT ON THE GAS TESTING LABORATORY FOR 1903.

At the end of January last a complete equipment of modern French gas testing apparatus, such as is used at the present time in the Paris gas testing stations, was received and at the beginning of April an efficient control of the Cairo gas supply for purity, pressure and illuminating power was begun.

#### PURITY.

The only standard for purity recognized in France and demanded by the Cairo contract is that the gas shall be entirely free from sulphuretted hydrogen.

This impurity has, however, been found present on three occasions and each time the Company have been fined 50 francs.

#### PRESSURE.

The contract requirements for pressure, namely that it shall not fall below 15 millimetres during the hours of public lighting, are very inadequate, especially in view of the increased use of gas for heating purposes. Except on several occasions when the pressure has momentarily fallen to zero, doubtless due to shutting off the gas in connection with repairs to the mains, the pressure has always been above that demanded.

The mean pressure between sunrise and sunset is about 30 millimetres, and between sunset and sunrise about 25 millimetres, while the lowest pressure recorded (excepting on the several occasions mentioned) was 18.5 millimetres.

#### ILLUMINATING POWER.

When first tested the illuminating power was found to be considerably below the contract requirements, on one occasion falling as much as 34°/<sub>o</sub> below the standard, while the mean for the first month was 19.5°/<sub>o</sub> too low. Gradually, however, the illuminating power has improved, and since August it has invariably been better than the contract demands.

Since the Government are not required to pay for an illuminating power not supplied, varying sums amounting in all to L.E.435.638 Milliemes were deducted from the Company's invoices whenever the mean illuminating power for the month was deficient, the invoices being made out on the assumption that the illuminating power is always according to the contract.

The following table summarizes the various results obtained:-

Months.	PERITY. So of times impure	Fines for impority.	Paessune Minimum.	ILLUMINATING POWER.  [bevintion from contract.	Fines for defluient illuminating Power.	
		L.E. M.	Millianetre		1. E. M.	
April		-	2211	19:5% helow.	No deduction made.	
May		-	185	6499 ~	111 530	
June	_	_	23%	6.1%	92 604	
July	_	_	21%	10.3%	158 189	
August	-	-	1901	4.2%	73 315	
September	-	-	2141	0.3% above.	_	
October	1	1 928	2130	3:4%		
November	1	1 928	1990	4.1%	_	
December	. 1	1 928	24(3)(3	3:0%	_	
Total	3	5 784	_	-	135 638	

It will be seen, therefore, that the direct result of the regular and systematic testing of the gas supply has been an increase of over 20%, in the illuminating power and an infliction of penalities amounting in all to over L.E. 441.

# RAPPORT DE M. COUDERCHON

SUB

# L'INSTALLATION DU BUREAU D'ESSAIS PHOTOMÉTRIQUES AU MINISTÈRE DES TRAVAUX PUBLICS, AU CAIRE.

L'appareil photométrique installé dans un local dépendant du Ministère des Travaux publics, est indentique à ceux en usage dans les bureaux d'essais de la ville de Paris.

La balance a été construite par Deleuil ; le bec Bengel, monté sur chandelier, est alimenté par un tube rigide métallique reliant la sortie du compteur au chandelier. La balance et le chandelier sont supportés par un bâti en fonte.

(1) L'extrémité du tube conique de la lunette a deux centimètres de diamètre.

Le local est spacieux et très bien ventilé; une hotte en tôle avec tuyau de dégagement sur l'extérieur est placée au-dessus des brûlures, dans les conditions règlementaires.

(2) Défectuosités constatées dans les appareils.— Le plateau de l'étrier de la balance, sur lequel repose la lampe pendant les essais, est de 6 millimètres plus grand dans le sens de son diamètre que le bord extérieur du fond de la lampe, de sorte que la lampe joue dans l'étrier; si donc cette lampe n'est pas parfaitement centrée sur l'étrier, elle perd su verticalité et incline soit en avant soit en arrière du plan parallèle au disque photométrique passant par le centre du bec Bengel.

La flamme de la lampe Carcel peut dévier ainsi de 2 centimètres environ soit en avant soit en arrière et sa distance au photomètre se trouve être de 0<sup>m</sup>98 à 1<sup>m</sup>02.

Le bec Bengel étant à 1<sup>m</sup>00, l'erreur commise de ce fait peut aller jusqu'à 4 %.

A plusieurs reprises, dans nos visites à la chambre noire du département, nous avons constaté cette position anormale de la lampe et nous en avons fait l'observation à M. Lucas, chef du Laboratoire et à M. Samman, son aide.

(3) Bec Bengel. — L'instruction pratique de Dumas et Regnault, décrivant la nature et les dimensions des appareils photométriques, fixe

à 10 de millimètre le diamètre moyen des trons du bec Bengel. Or, nous avons constaté au moyen de notre aiguille-jauge, que les trous du bec Bengel en service à la chambre noire du Ministère des Travaux publics, n'avaient que 10 de millimètre de diamètre, en moyenne.

D'autre part, le diamètre du courant d'air intérieur du bec Bengel doit être de 9 millimètres ; or, dans le bec Bengel que nons avons vérifié, ce diamètre est de 9 millimètres dans la hauteur du tube en porcelaine, mais il n'est que de 6 à 7 millimètres dans la hauteur de la partie métallique. L'air d'alimentation intérieure de la flamme n'est donc pas suffisant.

Ces deux défectuosités contribuent à rendre la flamme moins éclairante, le gaz brûlant dans de mauvaises conditions.

Nous estimons à 2% l'erreur commise de ce fait au détriment du pouvoir éclairant.

(4) Compteur d'abouné. — Le gaz, avant d'arriver aux appareils photométriques, passe par un compteur ordinaire d'abouné de dix becs de capacité. Il y a lieu de supprimer ce compteur qui n'est d'aucune utilité, la Compagnie devant fournir gratuitement au Gouvernement le gaz consommé par le laboratoire photométrique.

La benzine est très soluble dans l'eau; une partie de celle contenue dans le gaz destiné aux essais peut donc se dissoudre dans l'eau du compteur et cela au préjudice du pouvoir éclairant du gaz. Le gaz doit venir directement de la conduite de la rue au compteur photométrique, sans passer par un compteur intermédiaire.

(5) Vérification de l'étanchéité des appareils. — La vérification de l'étanchéité des appareils, lors de la vérification du compteur se fait jusqu'au robinet du chandelier du bec Bengel; nons croyons devoir faire remarquer que la recherche des fuites doit se porter jusqu'au bec Bengel même, car il peut exister une fuite, soit au raccord du manomètre, soit au raccord du bec Bengel; le bec Bengel lui-même peut fuir s'il se produit une fissure dans le tube en porcelaine, comme cela arrive quelquefois,

Nous avons indiqué à M. Lucas, le moyen de faire cette recherche de fuite, en obturant les trous du bec Bengel avec la paume de la main et en ouvrant le robinet du chandelier pour établir la pression jusqu'au bec.

(6) Nombre d'essais à effectuer dans la soirée. — Dans la méthode employée à Paris pour la vérification du pouvoir éclairant du gaz, il est spécifié que les essais scront effectués de huit heures à ouze heures du soir, c'est-à-dire au moment du plein éclairage, que les expérimentateurs feront trois essais à une demi-heure d'intervalle, et que le titre du gaz sera établi en prenant la moyenne des trois essais.

- (7) Or, nous avons remarqué, en examinant les rapports journaliers des essais, que lorsque dans un essai la consommation de l'huile est en dehors des limites de 38 à 46 grammes à l'heure, cet essai est annulé, et qu'ainsi la moyenne est calculée sur deux essais seulement ; il pourrait même n'y avoir qu'un seul essai valable si la consommation de l'huile était normale dans deux essais. Nous croyons qu'il y a dans cette manière de procéder, une erreur d'interprétation de l'instruction de Dumas et Regnault, et nous estimons que la moyenne des essais d'une soirée ne peut être établie que sur trois essais. Il suffit pour cela, lorsqu'un essai doit être annulé pour consommation anormale d'huile, de le recommencer en modifiant le régime de la lampe,
- (8) Température du laboratoire. Les rapports journaliers des essais indiquent que la température dans le local ou sont effectués les essais atteint généralement 20 à 23°, et jusqu'à 30°, dans les nuits d'été; l'eau du compteur et le gaz qui y passe prennent donc cette température, cela ne présente aucun doute surtout dans les cas particuliers du laboratoire du Gouvernement, où le gaz passe non seulement dans le compteur d'expérience, mais encore dans un compteur ordinaire d'abonné, situé dans le laboratoire même, comme nous l'avons fait remarquer plus haut.

On peut admettre que la température du gaz dans les conduites, (qui sont posées à un mêtre de profondeur dans le sol) est de 15°; c'est avec du gaz à cette température de 15° que les essais devraient être effectués.

Le gaz passant de la température de 15° à celle de 20°, 25° ou 30°, se dilate plus ou moins et l'accroissement de volume lui fait perdre nécessairement de son pouvoir éclairant.

Le coefficient de dilatation des guz est de 249 de leur volume pour 1 degré, ou 0,003665.

Si nous appliquons la formule.

$$V_0 = V X \frac{1 + \alpha c I_0}{1 + \alpha c I}$$

V étant le volume du gaz consommé pendant l'essai à la température t (température de la chambre).

V<sub>o</sub> étant le volume du gaz à la température t<sub>o</sub> (température du gaz dans les conduites)

∝ étant le coefficient de dilatation pour 1°, nous aurons pour le cas d'une température de 30°

$$V_{\rm o} = V_{\rm o} X \frac{1 + 0.003665 \times 15^{\circ}}{1 + 0.003665 \times 30^{\circ}}$$

$$V_o = V X \frac{1.054975}{1.109950} = V X 0,95$$

c'est donc par ce coefficient de 0,95 qu'il faudrait multiplier le chiffre de consommation de gaz donné par les essais, pour avoir le titre absolu du gaz; en ne tenant pas compte de cette correction, on fait une erreur au détriment de la Compagnie du gaz, de 5 %, dans le cas particulier que nous avons pris et qui est, nous le reconnaissons, un maximum « en supposant que la température de la chambre ne dépasse jamais 30° ».

Les coefficients de correction aux diverses températures de 15 à 30°, sernient de :

pour	150	• • •	• • •				 0 0 0			1,000
	16°					8 0 p	 			0.996
	170						 			0,993
	180	0 0 4					 		* * *	0,989
	10"				m • •		 * * *	400		0,986
	200						 			0,982
	210						 	110		0,979
	1)1)0			• • •			 ***			0,976
	230			* * >		400	 		***	0,972
	240						 			0,969
	250					***	 	* 4 *		0,966
	270						 			0,960
	280					4.0.4	 	***		0,956
	29 <sup>n</sup>					4 = 4	 	• • •		0,953
	300						 		* * *	0.950

La correction relative à la température ne se fait pas à Paris parce qu'on a admis que la température moyenne des chambres noires était à Paris, de 15°.

En été, en effet, la température des chambres noires ne dépasse pas 18°, et en hiver, il est facile de maintenir la température des chambres noires entre 12° et 16°, au moyen de la chaleur artificielle.

La correction est appliquée à Lyon, à St-Quentin et dans d'autres villes de France, mais notamment à Londres.

Il est de toute justice de l'appliquer au Caire, où la température extérieure est toujours au-dessus de la température moyer ne du gaz dans les conduites.

(9) Emplacement du bureau d'essais du Gouvernement. — Le bureau d'essais du Gouvernement est situé à 3700 mètres de l'Usine, à l'une des extrémités de la ville du Caire, et dans un quartier où la consommation publique et privée est très faible.

Cette situation est des plus défavorables à la Compagnie du gaz, pour deux raisons principales:

- 1º. Il est admis par les techniciens, et par toutes les personnes qui s'occupent de gaz. Compagnies et Municipalités, que par un frottement continuel dans le parcours des conduites, le gaz, si bien fabriqué qu'il soit, perd une partie de son pouvoir éclairant évalué à 1 º/g par kilomètre.
- 2°. Il est également recomm par tout le monde, que le gaz qui s'immobilise, qui est stagnant dans les conduites, perd également de son pouvoir éclairant.

A l'appui de ces considérations, et pour en justifier le bien-fondé, nous rappellerons que, par application de l'article II, du traité du 7 février 1870, entre la ville de Paris et la Compagnie parisienne du gaz, les bureaux d'essais, à Paris, sont choisis par la ville, d'accord avec la Compagnie, vers les régions moyennes du réseau alimenté par chaque usine.

(10) En outre, et quoique les bureaux d'essais soient situés dans ces conditions, c'est-à-dire dans des emplacements où la consommation du gaz est considérable et où, par conséquent, le gaz ne séjourne pas dans les conduites, la ville autorise encore la Compagnie à purger la conduite secondaire et le branchement alimentant la chambre noire au moyen d'un bec intensif de 1.400 litres de débit à l'heure, raccordé sur le branchement de la chambre noire et que la Compagnie fait allumer à l'heure que bon lui semble et, au besoin, toute la journée.

En résumé, nous sommes d'avis qu'il serait de toute équité, que le Ministère des Travaux publics voulût bien tenir compte de toutes les considérations exposées dans la présente note, et reconnaître que la Compagnie du gaz du Caire, n'a qu'un but et qu'un désir, exécuter fidèlement les clauses du contrat, comme elle croit l'avoir fait jusqu'ici et remplir tous ses devoirs envers le Convernement et envers ses abonnés.

La Compagnie est donc en droit de demander de la modération et de la bienveillance à l'Administration Gouvernementale. (11) Nous espérons que l'Administration voudra bien supprimer les amendes, ou plutôt les retenues, relatives au pouvoir éclairant du gaz, appliquées à la Compagnie pendant la période de l'été dernier qui court du mois de mai au mois d'août.

Avant de clore ce rapport, je tiens à dire que j'ai trouvé auprès des divers agents du Ministère des Travaux publics le plus aimable accueil et que, en particulier, M. Lucas, chef du Laboratoire, m'a reçu avec la plus grande courtoisie. Il n'a pas hésité à me faciliter toutes choses et à me laisser opérer en toute liberté. J'ai pu ainsi me convainere qu'il apporte à ses travaux, en ce qui nous concerne, tout le soin et la minutie scientifique d'un homme de Laboratoire uniquement préoccupé de rechercher la vérité.

Le Caire, le 16 décembre 1903.

Signé: Couderchon.

Ingénieur des ponts et chaussées, Inspecteur de l'éclairage au gaz de la Ville de Paris.

# MR. LUCAS' NOTES

ON

# MR. COUDERCHON'S REPORT.

N.B.—For purposes of reference the paragraphs in the original have been numbered and are referred to below under their respective numbers.

(1) The Government Photometer corresponds, and has always corresponded, exactly in this particular also to the instruments used in Paris.

The Gas Company's Photometer, as mentioned in my report for August last, had an aperture in the eye-piece that was much too small. This has been altered in accordance with Mr. Couderchon's instructions and is now correct.

(2) The instrument is as received from the makers.

The base of the lamp certainly fits too loosely into the scale pan of the balance, but the difference is 4 millimetres and not 6 millimetres as stated.

Care has always been taken in placing the lamp to avoid any inclination from the vertical position.

It is assumed by Mr. Couderchon that the error (if any) has always been against the Company. Since 60 different experiments are usually made each month this is barely possible unless done deliberately. It is likely that the lamp has occasionally deviated slightly from the perpendicular, but probably as often in favour of the Company as against, and in such cases it is usually found that the errors balance one another.

It is proposed to at once fix a metal ring to the base of the lamp so that the diameter shall correspond exactly with that of the balance and any possibility of error will thus be avoided for the future.

The Company's Photometer has the same defect.

(3) The Bengel burner deviates, as stated, from the standard laid down by Dumas and Regnault. It is, however, as received from the makers.

The defective burner has now been replaced by one kindly supplied by M. Conderchon, and examined by him in Paris and found to be correct.

- (4) The Company and not Government fixed the meter in order that they might charge for the gas consumed, and the Government have paid about L.E.4 for the gas used since the testing commenced.
- (5) The entire apparatus has been tested for leakage regularly once each week since it was erected.

The Company has on several occasions complained of the high pressure in the manometre affixed to the Bengel burner; had there been a leakage this pressure would have been below instead of above the normal.

- (6) The Paris contract does not hold in Cairo, where no hours are specified. Further it has been found necessary in Paris to test the gas outside the contract hours, and since 1887, on the demand of the Municipal Council, such extra tests have been regularly made.
- (7) During May, June, July and August various sums, amounting in all to L.E.435.638 mill., were deducted from the Company's invoices on account of the gas being below the contract requirement. Since August no such deductions have been made as the gas has been equal to the standard required.

During May and June there were no experiments "annulés".

During July one experiment was annulled, while during August there were five.

If the tests made on these evenings when one of the three experiments was annulled be entirely disallowed, instead of the results being in favour of the Company, as apparently is thought, it will be slightly against them.

Thus in July the gas was 10.3% below the contract, while in August it was 4.2% below. Disallowing all the tests on those nights when one experiment was annulled the mean for the month will be:—

July 10.7°/, below contract, August 5.0°/, below contract,

and the Government could claim a still further (though very slight) deduction from the gas accounts for those months.

For the future an extra experiment will be made and the mean of three instead of two taken, should one be annulled.

(8) I am of opinion that the difference of temperature was taken into account once for all when the contract was drawn up.

In Cairo the burners must correspond with those in Paris, and the consumption of gas per burner must also correspond, but the amount of gas required to equal one Carcel is fixed at 110 littres instead of 105 litres as in Paris.

The mean Paris temperature at 9. p.m. (see attached note) is 10°57°C., while that of Cairo is 20°33°C. Now 105 litres at 10°57°C. will become 108°6 litres at 20°33°C., and under the contract the 105 litres of Paris gas are allowed to become 110 litres in Cairo.

In those French towns where a correction is made for temperature the standard is 105 litres as in Paris and not 110 as in Cairo.

No appeal to the English practice should be allowed, since the whole manner of testing in England is entirely different from that in France.

No reference to a temperature correction is made in the Cairo contract.

- (9) The Company would seem to contend that the gas need fulfil the contract requirements only within a limited distance of the works and that elsewhere it might be of an inferior quality. This is untenable, (see pages 271 and 277).
- (10) There seems no objection to the Company putting up such a burner as suggested, provided the consumption of gas be not charged to the Government.
- (11) A return of the amount deducted from the Company's invoices for inferior quality of gas would seem to be a tacit admission that the Government tests were not reliable.

In addition I would point out that the meter through which the gas passes to the Photometer registers from 0.15 to 0.25 of a litre too little, or a mean of 0.20 litre.

In Paris any deviation of this kind from the 25 litres is allowed for in tests.

I have purposely refrained from making an allowance for this difference up to the present, although I propose doing so in the future, and thus there has always been an error of almost 1% (0.20 for 10 grams of oil =0.84 for 42 grams of oil) in favour of the Company.

In conclusion I wish to express my entire confidence in the ability and impartiality of Mr. Conderchon, and in the careful and thorough manner in which all his work was conducted.

To prove that the difference in temperature between Cairo and Paris was taken into account in drawing up the contract.

MEAN TEMPERATURE AT ? P.M.

	MONTH				Pauls (1) (1896).	(15 years 1884-1898).
,					•9 4 = 43	100-710
January				2 0 0	3.70	12.10
February					4.16	13.67
March		•	4.4.6		8.97	16.02
April				1 0 0	10.00	19.78
May		***	111		14.07	23 - 22
June		1			18*(10)	26 • 25
July		+ + 4	• • •		19.68	28 • (Ki
August					16-41	26.00
September.	***				14.73	24 • 64
October			10.00	* * * *	5.03	22.30
November.			* 4 *		3.28	17 • 25
December.	***		0.01	111	4.01	13.84
	Мих	S		* * *	10.57	20:33

105 litres (Paris standard) at 10°57°C=101°1 litres at 0°C, =108°6 ... at 20°33°C.

105 litres at Paris=108 ti litres at Cairo.

Paris standard 105 litres.

Cairo standard 110 litres.

Annales da Bureau central Météorologique de France. Année 1896. Tome II. Observations.
 Report on the Meteorological Observations made at the Abbassia Observatory. Unico. 1990, p. 20.

## EXTRACT FROM

# "PUBLIC LIGHTING BY GAS AND ELECTRICITY",

BY

# W. J. DIBDIN, F.I.C., F.C.S.,

Chemist and Superintending Gas Examiner to the Metropolitan Board of Works and the London County Conneil (1882-1807).

In the Gasworks Clauses Act it is stated that the Company shall provide a properly-fitted station for testing the illuminating power and purity of gas, but no specific position is assigned for the station, which is usually that arranged by the Company for its own purposes. In the Metropolis Gas Act of 1860, relating to the testing of the London gas, it was first provided that the site of the testing place should be within 1000 yards of the gasworks, but subsequently in 1876 this was altered so as to leave the Gas referees a free hand in fixing the position of the stations, in order that the gas might be tested in the district in which it was used rather than in the near proximity to the making places.

The necessity for more effective methods of testing the illuminating power of the gas supplied to the consumers has been frequently pointed out by the writer in the course of various official reports, in consequence of the discovery that the gas supplied in the district away from the official gas-testing station was very frequently 10%, and even 20% below the standard. This fact was also pointed out at Liverpool by Mr. Bellamy, who adopted the system of testing the quality of the gas by the portable photometer, with the result that the supply, although in the hands of a company, was immediately equalised throughout the district, so that all consumers are now supplied with gas of equal value.

(Chapter I, page 86).



## TRAMWAYS AND ELECTRIC LIGHTING

#### TRAMWAYS

# CAIRO TRAMWAYS.

The working of the tramways has been very satisfactory, and no abnormal irregularity has occurred. The attached statistics show a considerable increase in traffic and receipts. Thus the number of passengers exceeds last year's figure by 13 % and the number of carkilometres has increased by 20 %. This is partly due to the opening of the Shubra line in May, 1903. This line connects the Bab-el-Hadid Square with the Nile bank at Rod-el-Farag, following the Shubra road for a length of nearly 5 kilometres. The track is chiefly double.

A great improvement has been introduced from a purely tramway point of view, by laying a line round the Mixed Tribunals. All cars going to Fagalla run now on this line, leaving the old track between Ataba-el-Khadra and the Crédit Lyonnais for the Boulac cars exclusively.

351 metres of double track has been substituted in the Place Mariette, near the new Egyptian Museum, for a similar length of single track.

# STATISTICS.

5717(1147111)		
	YEAR E	NDING
	June 30th, 1902.	June Suth, 1988.
Length of concession	50 ye 194	
L—Traffic.  Total number of passengers  Average daily number of passengers  Same in % of population  Train kilometres	16,926,050 46,373 7 * 73 3,659,729	19,225,331 52,672 8 • 2 4,378,580
II.—LANE AND CARS. Length of single track lines (metres) Length of double track lines Total length of lines Number of motor cars Number of trailers	15,296 22,475 37,771 95 59	15,681 27,294 42,975 128 79
Slare Capital	2,256,671 1,042,627 46°5 11°7	2,530,242 1,200,749 47·5 13·7 85,232 47,351 840,000 0•58

# ALEXANDRIA TRAMWAYS AND RAMLEH RAILWAY.

The Alexandria and Ramleh Railway Company have transformed their lines between Alexandria and San-Stefano to electrical traction. For this purpose the tramway generating station at Karmonz was increased by 2 new sets of 1000 HP, each, producing a threephase current of 6500 Volts. This energy is transmitted to a sub-station situated at Bulkeley, first, by means of an underground high tension cable, running through the town of Alexandria, and secondly, by an overhead line, following the railway-track from the town-end to Bulkley. The sub-station contains 3 sets of step-down and rotary transformers of 300 K.W. each, by means of which the threephase high-tension current is converted into continuous current of 550 Volts, and distri-Transformers and Switchboard were buted to the contact-lines. furnished and erected by Messrs. Brown, Boveri & Co. and are of the latest type. The high tension overhead line was constructed by the Alexandria and Ramleh Railway Company itself, under the superintendence of this Service and every possible protective apparatus was installed with a view of preventing danger to life, in case of a wire breaking.

The electric traction was started at the beginning of January. The inspection and handing over of the installation took place on December 17th.

The accompanying tables show the extent of traffic on the two lines at the end of the year 1903:—

	A Alexandria Transway	R Rambeh Ramway
Length of single track un. Length of double track	1,125 11,000	7,033 17,164
Total track	12,125	24,197
Number of motor cars	55 45	22 34
Number of passengers conveyed	9,293,272	3,062,749

## CAIRO ELECTRICAL SUPPLY.

The number of private consumers, as well as the amount of current sold, has again considerably increased. This is shown on the attached tables.

6.4 kilometres length of new cable was laid under the public roadways as against 7.9 kilometres in the previous year.

For the purpose of purchasing a new generating plant of 400 HP, the Company requested permission to increase their share capital by 500,000 francs. This request, after examination by the Committee previously appointed, was granted.

Several applications for supplying current outside the limits of the concession having been made by the Company, Government, in individual cases, granted temporary authorization. The distribution of current in the suburbs of Cairo is now being studied by this Office.

ELECTRIC LIGHT, CAIRO.

	YEAR ENDING	SOTH JUNE
General.	1902	11013.
Units sold K.W. hours, Increase on previous year % Number of lamps connected (10 c. p.) Units sold per 10 c.p. lamp Arc-lamps connected H.P. Motors connected H.P. New cable laid during year metres. Number of consumers	458,253 24.8 54,152 8.38 79 22 7871 1180	529,478 15,3 64,160 8,25 97 95 6429 1409
FINANCIAL.		
Capital Fes. Revenue (Units sold) Working Expenses Cost per unit sold Price per unit	2,500,000 458,144 272,272 0°594 1°00	3,000,000 529,349 342,780 0°646 1°00

Note.—These figures are presented by the Company.

# Mansoura.

Street lighting has not been extended this year, but the number of private consumers shows an increase of 46°/<sub>a</sub> and has reached the figure of 140, representing a total of 5934 8 c.p. lamps connected.

The figures for 1902 were 96 subscribers and 4350 lamps.

#### Helouan.

The provisional handing over of this installation took place on November 25th, 1902. A temporary authorisation was granted to Messrs, Thos. Cook & Son, to work the plant, subject to the condition that certain modifications were to be introduced and certain defects to be remedied. A second was made on December 1st, 1903, after the Local Commission had stated, in writing, that the installation was complete.

This examination, however, proved that the concessionnaires had not succeeded in entirely overcoming all defects. As stated in our report of December 2nd, the voltage fluctuations were too considerable and caused unpleasant flickering. No provision had been made to prevent the smell of the petrol escaping. The bad smell and loud noise, caused by the explosions, led to general complaint, and a petition signed by 150 residents and tourists was presented to the Public Works Department.

The Supply Company were invited to at once remedy these defects and were further required to check the fluctuations by the end of the season. The final reception could in this manner be pronounced 6 months later. At the end of the first full working year, on December 31st, the extension of the installation is shown by the following figures:

Street lighting: 200 standards of 2 lamp	8 1	auch,		
private lamps connected (10 c.p.)=				3894
Number of comsumers=				77
Units sold a) to hotels=				[Second
b) to private consumers =			,. I	[7400
Total			:	32400 KWH

Price per unit 4 P.T.

Street lighting is paid for at the rate of L.E. 2.25 for each lamp of 26 candle power. As this sum has proved to scarcely cover the cost of production, Messrs. Thos. Cook & Son asked for permission to replace the 16-c.p. lamp by one of 10-c.p. and to increase the time of lighting in the same ratio. This would relieve their engines to a certain extent in the early part of the night, and allow for more private lamps to be connected. The High Commission was asked to approve of this alteration, as being generally advantageous, subject to the acceptance by the concessionnaires of a new lighting schedule, prepared by the Government Electrical Service and adjusted to the period of the rise and set of the moon.

Since February, these schedules have been in use, and it has been found possible to arrange the lighting in such manner, that the town

is never in complete darkness. This frequently occurred with the old contract time-table.

The total amount of energy spent in street lighting is the same as before.

# Port Said.

The Government signed a contract for private lighting with Eugène Lebon & Co. in July, and the plans were submitted and examined by this service in November. This distribution of 2 × 220 Volts continuous current will be effected by overhead lines on iron poles and wall-brackets throughout the town. The total capacity will be 120 H.P. The concession bears a provisional character and can after the 5th year be withdrawn at one year's notice. Public electric lighting cannot be introduced, on account of the existing contract with the same Company for gas lighting.

#### Cihiza and Gheziru.

Tenders for the distribution of electricity at Ghiza and Ghezira were invited on May 12th, 1903. The Gas Company alone tendered, but the conditions offered were considered too onerous, especially so far as street lighting is concerned.

The absence of other tenders may be ascribed to the fact that the present number of private consumers would be very small as compared with the area to be provided with distributing lines.

#### Ismailia.

The deed of concession was signed on February 13th, 1903, and owing to the rapid execution of the work the provisional handing over took place as early as July 30th, and street lighting followed at once. The installations were completed soon after and definitely accepted on November 11th, 1903. At the end of the year, 1785 lamps, representing 63 subscribers, and 175 street-lamps were connected to the Company's lines. The total capacity of the plan is 58 H.P. and 3886 units have been sold.

In this town the street lighting is not paid for by Government, but by the Suez Canal Company; Government is interested in this installation only so far as measures for public safety and regularity of service are concerned.

#### Suez.

A contract was signed for the lighting of this town on June 10th, 1902, and the installation was to be finished twelve months later. The contracting party, having failed to finish in time, obtained two prolongations. January 1st, 1904 was fixed as the final date of completion.

Actual work had not been commenced, when in September 1903 the concessionnaire asked for permission to transfer his authorization to the "Société Electrique d'Ismailia." This demand was granted, subject to the condition, that the installation should be started immediately, and that the fine of L.E. I per day should be paid, as stipulated in the original contract, from 1st of January 1904 till the day of completion.

The work is now proceeding.

#### Tanta.

Authorization was given to M. Nahman in 1901 to erect a large generating station to provide Tanta and Zifta, as well as the neighbouring districts, with electric light and power, but, owing to the want of capital, this project was never executed, and a part of it only, the lighting of Tanta, is being carried out now by the "Société Electrique de la Basse-Egypte" which was formed by M. Nahman for this purpose.

## TELEPHONES.

The Telephone Company was authorized to establish a double line between Cairo and Alexandria. Communication was opened to the public in May, 1903 and is being largely patronised. The line follows the railway line throughout its length.

The Ministry of Interior has several times asked for advice concerning the police telephones, and local inspection in the district of Zagazig was undertaken by this Office.

Several complaints from subscribers to the Fayoum telephone installation were submitted to this Ministry by the Mudir. The installations were examined by this Service in November and a report, pointing out grave technical defects and general mismanagement, was submitted.

#### CAIRO STREET LIGHTING.

In connection with negociations carried on with the General Manager of the Gas Company and concerning the reduction of price for public lighting in Cairo, a project was elaborated by this Service for lighting by electricity all streets which are not at present lighted by gas. It was proposed that this generating station be worked by Government.

Calculations were based on 6000 incandescent lamps and 300 are lamps. According to this project the total cost would be L.E. 2.600 per lamp and per annum, as against L.E. 6.75, the present rate per

gas lamp.

This project, which would mean an annual saving of L.E. 24,900 on the lighting of the whole city of Cairo at present rates, was submitted to the Ministry of Finance in October.

#### NEW REGULATIONS.

The regulations drawn up by this Service have been printed and submitted to the Contentieux and the various Administrations and Companies interested.

# KASR-EL-AINI HOSPITAL.

The Director General of the Sanitary Department having decided to light this hospital by electricity, our Electrical Service was charged with the preparation of a project and the superintendence of the installation.

It was found more economical to erect a generating station, than to buy the current from the Gas Company. Continuous current of 100 volt was considered suitable, and a suction gas-plant was chosen for driving the dynamo. A battery of 290 amp. hours, was also provided, to supply current during the night.

Tenders were invited on June 11th, and the work placed in the hands of Messrs. Siemens & Halske for the electrical part, and of Messrs. Nahman & Co. for the motor and suction gas-plant.

Over 500 lamps and 2 contact boxes for X ray treatment were installed.

The hospital building, Lady Cromer's Home, the Sisters' house, the Medical School and the Director's house are connected to the generating station.

The electrical part was completed on December 16th, whilst the motor plant is still under construction. The output of the dynamo is 20 KW, and the total cost L.E. 1,600.

#### CAIRO SEWER PUMPS.

Two centrifugal pumps of 25 HP, each have been erected on the old Isamilia Canal for pumping the rain water and street-drainage into this canal. The pumps are driven by two singlephase motors from the Gas Company's mains, the high tension current being transformed at the pumping station by our own transformers.

In case of heavy rainfall, these pumps are capable of discharging 4000 cubic metres of water per hour. They were used for the first time on December 24th when they discharged the whole of the street water during a rainfall of 3½ hours.

Since April 1903, except during June and July, these pumps have worked once or twice every week, to discharge the surface water accumulating in the pipes.

The cost of ordinary pumping is high and it is proposed to use a wind motor for all work except pumping out rain water. On the night of 11th-12th September the lake in the Esbekieh Garden, containing 3000 c.m. of water and mud, was emptied into the drains, and considerable trouble was caused at the pumping station by the thousands of small fish entering the pipes and choking the strainer. The fish had to be removed by hand.

TABLE SHOWING THE WORK OF THE PUMPS DURING THE YEAR.

Mostn.	Times.	Hours.	Amount of water pumped.	K.W. lors.	HEMARKS.
March	2 2 5 1 4 8 6 4 12	2. 2133   -3121   -4 5 5 8 45	2380 3780 280 2240 7560 6850 21250	80 34 54 54 4 32 106 98 91 308	Tests (without water).  The canal was dry thow water).  Emptying of lake in Ealishich tiarden.  I torrential minfall.

## MINOR INSTALLATIONS.

Installations in public buildings, mentioned in last year's report, were, as before, controlled and supervised by this Service. The following new installations were added:—

Museum.—The fire-alarm bell was removed from the front to the police sub-station behind the main building. The 15 copper wires were carried to the roof, where they follow the coping, supported on insulators carried by wooden brackets and poles.

46 lamps and wall-plugs were fitted in the Secretary's house and electric bells in the house of the Director.

Ministry of Justice and Foreign Affairs. -50 incandescent lamps and ventilators.

Post Office Building.—25 lamps and electric bells in the Director's residence.

Lunatic Asylum, Abbassia.—An electric pumping plant of <sup>3</sup>/<sub>4</sub> HP, was connected to the generating station, for pumping water into a reservoir of 100 cubic metres capacity and 12 metres height.

Khedivial Library.—Specifications have been prepared for 6 are lamps and 40 incandescent lamps. The installation will soon be completed by Messrs. Thos. Cook & Son. for the sum of L.E. 108.500 Mills.



# GHIZEH SERVICE AND EZBEKIEH GARDEN HELWAN WATER

# GHIZEH AND GHEZIREH WATER SERVICE

(MR. CURTIS)

A new 25 c/m main has been laid to supply the new Ghezireh Garden, this has greatly improved the whole service north of the pumps, as, since this main was opened, we have no complaints of want of pressure.

A new pumping station was erected below the English bridge with a new compound 65 H.P. semi-portable engine and a 35 c/m Dumont centrifugal pump for the irrigation of Ghezireh. The total cost of this installation was: L.E.1,290.

The old pumping station on the Nile bank for which the above is a substitute has been demolished and the road widened, thus considerably improving this promenade.

The large compound horizontal engine was removed from this station where the area to be dealt with was not large enough to allow of its developing its full power and was erected in Ghizeh, where it will drive a Dumont 50 c/m centrifugal pump. When completed this pump will supply the whole of the low pressure water required by the Ghizeh Service.

Special work to the amount of over L.E.5,000 has been executed by the Ghizeh Workshops at the request of the Departments interested: I may mention the complete installation of the chemical and physical laboratories, including their complicated gas and water fittings, furniture, desks, etc., for lecture and class rooms, museum, etc., etc., of the Agricultural College. The Chemical Laboratory for the Khedivial Agricultural Society was executed on the same lines. For the Geological Museum, show cases, desks and tables were made.

# SUPPLY OF WATER.

Government account	000 000	L.E.	5.709	232			
HH. Prince Hussein and Princess	Fatma	2-21 0-21		an Cross			
Hanem	*** ***	**	661	482			
Private persons	*** ***	**	886	721			
The state of the s		40	176	378			
Total		LE.	7,433	813			
ORDINARY EXPENDITURE	(2,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		Class				
Chinoant Markabili HE	THIARI	1 AND	THE	TIRE	1.		
Salarie		LE.	T ADADER	185			
Coal			2,067	726			
Oil, tallow, waste, etc		60	137	975			
The state of the s	*** ***	29	374	937			
				6,438			
	T	stal	D e e	• • •	L.E. 4	240	K2
EXTRAORDINARY	EXPEN	and the same of th	150				
			4220				
New office		LE.	48	729			
Boring for water		**	147	821			
Separate water service to new Gh	ezireli						
Garden		33	281	784			
Purchase of water meters		oğ	184	982			
Purchase of east iron pipes		40.	623	751			
	rp:	4-1			T TO .	***	
	10	tal			L.E. 1	201	Uú
T !	791						_
Total	zpendit				L.E. 5		KIK
Total e	expendit						_
Total	expendit						_
_	_	ire		!	L.E. 5	,536	HER
atement of work executed in the	Ghize	nre		!	laE. 5	,536	NJK NOW
tement of work executed in the 1903, not including require to	Ghize	nre		!	laE. 5	,536	NJK NOW
_	Ghize	nre		!	laE. 5	,536	NJK NOW
ttement of work executed in the 1903, not including require to Services.	Ghize	nre		!	laE. 5	,536	NJK NOW
tement of work executed in the 1903, not including require to Services.	Ghize	ure h We		!	laE. 5	,536	NJK NOW
tement of work executed in the 1903, not including require to Services.  General Tanzim Survey Department	Ghize	h We	 orksh and	ops Gh	laE. 5.	536 he y	NJK NOW
ttement of work executed in the 1903, not including requires to Services.  General Tanzim Survey Department	Ghize the G	h We	 orksh and	ops Cih	1.E. 5, for the exirch 172 385 188	536 he y	NJK NOW
ttement of work executed in the 1903, not including requires to Services.  General Tanzim Survey Department Esbekish Garden Ghizeh Nursery	Ghize	h Wahiseh	 orksh and 	ops Gh	for the sireh	536 he y 110 214 024 358	NJK NOW
ttement of work executed in the 1903, not including requires to Services.  General Tanzim Survey Department	Ghize	h We	and	ops (ih	for the circle 172 385 188 97 349	536  he y 110 214 024 358 073	NJK NOW
dement of work executed in the 1903, not including repairs to Services.  General Tanzim Survey Department Esbekieh Garden Ghizeh Nursery Sanitary Department Helouan Water Service	Chize	h We	and	ops Ch	for the circle 172 385 188 97 349 178	536  he y 110 214 024 358 073 184	NJK NOW
ttement of work executed in the 1903, not including requires to Services.  General Tanzim Survey Department Esbekish Garden Ghizeh Nursery Sanitary Department Helouan Water Service Agricultural Society	Ghize	h We	and	ops Ch	for the zireh 172 385 188 97 349 178 66	536  he We 110 214 024 358 073 184 898	NJK NOW
ttement of work executed in the 1903, not including requires to Services.  General Tanzim Survey Department	Ghize	h We	and	ops Gh	172 385 188 97 349 178 66 179	536  he y 110 214 024 358 073 184 898 054	NJK NOW
ttement of work executed in the 1903, not including requires to Services.  General Tanzim Survey Department Esbekish Garden Ghizeh Nursery Sanitary Department Helouan Water Service Agricultural Society Agricultural Society Chemical Laboratories in the service of the service of the service and the service of	Chize the Ci	h Webliceh	and	ops Gh	172 385 188 97 349 178 66 179 2,105	536  he y 110 214 024 358 073 184 898 054 026	NJK NOW
dement of work executed in the 1903, not including requires to Services.  General Tanzim Survey Department. Esbekish Garden Ghizeh Nursery Sanitary Department Helouan Water Service Agricultural Society Agricultural Society Chemical Laboratories and Agricultural College, Laboratories and Agricultural College Sundries	Chize the Ci	h Webliceh	orksh and	ops Gh	for the sireh 172 385 188 97 349 178 66 179 2,105 52	536  he y 110 214 024 358 073 184 898 054 026 395	NJK NOW
dement of work executed in the 1903, not including repairs to Services.  General Tanzim Survey Department Esbekish Garden Ghizeh Nursery Sanitary Department Helouan Water Service Agricultural Society Agricultural Society Chemical Laboratories in Agricultural College, Laboratories in Agricultural College Sundries Benha Bridge Cairo Tanzim	Chize the Ci	h Webiceh	orksh and	ops Gh	for the sireh 172 385 188 97 349 178 66 179 2,105 52 25	536  he y 110 214 024 358 073 184 898 054 026 995 843	NJK NOW
dement of work executed in the 1903, not including requirs to Services.  General Tanzim Survey Department Esbekieh Garden Ghizeh Nursery Sanitary Department Helouan Water Service Agricultural Society Agricultural Society Chemical Laboratories in Agricultural College, Laboratories in Agricultural College Sundries Benha Bridge Cairo Tanzim Local Commission (Assouan)	Chize the Ci	h Webiceh	orksh and	ops Gh	for the sireh 172 385 188 97 349 178 66 179 2,105 52 25 410	536  he y 110 214 024 358 073 184 898 054 026 995 843 720	NJK NOW
dement of work executed in the 1903, not including requirs to Services.  General Tanzim Survey Department Esbekish Garden Ghizeh Nursery Sanitary Department Helouan Water Service Agricultural Society Agricultural Society Chemical Laboratories and Agricultural College, Laboratories and Agricultural College Sundries Benha Bridge Cairo Tanzim Local Commission (Assouan) Sporting Club (Ghezireh)	Ohize	h Webicoh	orksh and	ops Gh	for the sireh 172 385 188 97 349 178 66 179 2,105 52 25 410 155	536  he y 110 214 024 358 073 184 898 054 026 995 843 720 815	NJK NOW
dement of work executed in the 1903, not including requirs to Services.  General Tanzim Survey Department. Esbekish Garden Ghizeh Nursery Sanitary Department Helouan Water Service Agricultural Society Agricultural Society Chemical Laboratories and Agricultural College, Laboratories and Agricultural College Sundries Benha Bridge Cairo Tanzim Local Commission (Assouan). Sporting Club (Ghezireh)	Ohize	h We hizeh	orksh and	ops Ch	for the sireh 172 385 188 97 349 178 66 179 2,105 52 25 410 155 172	536 he y 110 214 024 358 073 184 898 026 995 843 720 815 001	NJK NOW
dement of work executed in the 1903, not including requirs to Services.  General Tanzim Survey Department. Esbekish Garden Ghizeh Nursery Sanitary Department Helouan Water Service Agricultural Society Agricultural Society Chemical Laboratories and Agricultural College, Laboratories and Agricultural College Sundries Benha Bridge Cairo Tanzim Local Commission (Assound). Sporting Club (Chezirch) New Polytechnic	Ohize	h We hizeh	orksh and	ops Ch	for 172 385 188 97 349 178 66 179 2,105 52 25 410 155 172 182	536  he y 110 214 024 358 073 184 898 026 995 843 720 815 001 701	NJK NOW
dement of work executed in the 1903, not including requirs to Services.  General Tanzim Survey Department. Esbekish Garden Ghizeh Nursery Sanitary Department Helouan Water Service Agricultural Society Agricultural Society Chemical Laboratories and Agricultural College, Laboratories and Agricultural College Sundries Benha Bridge Cairo Tanzim Local Commission (Assound). Sporting Club (Chezirch) New Polytechnic Old Polytechnic Anglo-American Hospital	Ghize the Gi	h We hizeh	orksh and	ops Ch	for 172 385 188 97 349 178 66 179 2,105 52 25 410 155 172 182 23	536 he y 110 214 024 358 073 184 898 026 995 843 720 815 001 701 629	NJK NOW
dement of work executed in the 1903, not including requirs to Services.  General Tanzim Survey Department. Esbekish Garden Ghizeh Nursery Sanitary Department Helouan Water Service Agricultural Society Agricultural Society Chemical Laboratories and Agricultural College, Laboratories and Agricultural College Sundries Benha Bridge Cairo Tanzim Local Commission (Assound). Sporting Club (Chezirch) New Polytechnic	Ghize the Gi	h Wahizeh	orksh and	ops Ch	for 172 385 188 97 349 178 66 169 2,105 52 25 410 155 172 182 23 103	536  110 214 024 358 073 184 898 054 026 995 843 720 815 001 701 629 901	NJK NOW
dement of work executed in the 1903, not including repairs to Services.  General Tanzim Survey Department Esbekish Garden Ghizeh Nursery Sanitary Department Helouan Water Service Agricultural Society Agricultural Society Chemical Laboratories and Agricultural College, Laboratories and Agricultural College Sundries Benha Bridge Cairo Tanzim Local Commission (Assouan) Sporting Club (Ghezirch) New Polytechnic Old Polytechnic Anglo-American Hospital	Oratory	h We hizeh	orksh and	ops Ch	172 385 188 97 349 178 66 179 2,105 52 25 410 155 172 182 23 103 189	536 he y 110 214 024 358 073 184 898 026 995 843 720 815 001 701 629	NJK NOW
dement of work executed in the 1903, not including repairs to Services.  General Tanzim Survey Department Esbekish Garden Ghizeh Nursery Sanitary Department Helouan Water Service Agricultural Society Agricultural Society Chemical Laboratories and Agricultural College, Laboratories and Agricultural College Sundries Benha Bridge Cairo Tanzim Local Commission (Assouan) Sporting Club (Ghezirch) New Polytechnic Old Polytechnic Anglo-American Hospital	Ghize the Gi	h We hizeh	orksh and	ops Ch	172 385 188 97 349 178 66 179 2,105 52 25 410 155 172 182 23 103 189	536  110 214 024 358 073 184 898 054 026 995 843 720 815 001 701 629 901	NJK NOW

# HELWAN WATER SERVICE

This Service has been working well throughout the year, an ample supply of water being given.

Two local bores were sunk at the pumping station to a depth of

50 metres without finding good water.

Water sold to private persons (by 510 water

Projects for filter beds are now completed and will, I trust, be executed in 1904.

# EXPENDITURE AND RECEIPTS FOR 1903.

Mª LEA OAS

On Government account		40 000	,, 117,441	
	Total		M³ 281,489	
Detailed Governn	ient uccm	int:		
Local Commission Baths and Hotel		M <sup>2</sup> 72,493 16,978		
Tanzim and Police Midan Said		11,420	3	
Station Garden Flushing pipes	909 050 900 050	, 1,632 5,637		
Receipts: Total		M <sup>3</sup> 117,441		
			TE	9 204 687

		Tota	al B	hlane	P	0 4 0	***	10	2,074	Tuo
	Tota		-						1,788	
				Tota	l	5 a 4	***	L.E.	3,862	699
From private persons Government account		***	***	***	***	***	• • •	La.E.	2,394 1,468	012

NOTE -Included in the sum of expenditure is L.E. DO paid for boring operations,

# SECTION No. 4.

The roads on this Section are all in fair condition. This year 6,905 M<sup>2</sup> of new road has been made, and must be added to the area of macadam. 45,399 M<sup>2</sup> of road have been macadamized with the steam roller at a cost of L.E.1,678, which works out to about 35 m/m per square metre.

Ordinary repairs to roads with punners and repairs to trottoirs have cost L.E. 766, making a total expenditure for the year on this Section of L.E.2,444.

# GHIZEH NURSERY AND TREES IN SECTION NO. 4.

In 1903, 4,045 trees were supplied by the Nursery and 39,265 pots of different kinds of flowers. At the Horticultural Show in March and Chrysunthemum Show in November the Service was very successful, obtaining two special gold medals and other prizes.

I have already reported on the condition of the trees in Section No. 4. Trees and branches that have fallen down or had to be removed, owing to their dangerous condition were sold in 1903 for over L.E. 200.

Statement of Receipts and Expenditure for the Ghizeh Nursery and Trees in Section No. 4 for 1903.

TREES, SHRUBS AND FLOWERS SUPPLIED TO GOVERNMENT GARDENS, CARRO.

Ezhekieh tiarden.			
Shrubs and trees			
Cairo Tanzim.			
Shrubs and trees			
Government Damietta.			
Tree 200			
Lunatic Asylum.			
Trees 50			
Military School.			
Trees 116			
Flowers in pots 499			
Section No. 4.			
Trees 120			
This represents a total sum of To private persons, trees 1,161	L.E.	618	660 260
To private persons, flowers 469	0.0	8	835
	L.E.	698	7.35
Sale of tunber from Section No. 4	96	466	200
Total	L.E. 1	1.164	955
EXPENSES.			
Stores and tools	L.E.	655	015
Watering and other earts, etc.	94	$\frac{167}{169}$	907 475
Total	LE.	992	397

# REPORT ON THE ESBERIEH GARDEN FOR THE YEAR 1903.

Attached is a statement of receipts and expenditures.

The lake has been filled in and its bed raised 40 c/m above the garden level. Owing to the excellent arrangements made by Mr. Curtis the whole of the material required, 9,275 cubic metres, was obtained gratis from carters desirous of getting rid of old building material. The filling by contract would have cost L.E.500. Trees will be planted on the site and the whole space arranged as a playground for children. The gate receipts are L.E.80 in excess of 1902, while L.E. 100 has been economised on water.

# ESBEKIEH GARDEN, 1903.

RECEIPTS FROM GATES		p 0 0	L.E. 1,26	382	
Exernses: Salaries gate clerks, garden English Band			L.E. 34 ., 15	8 000	. 500 321
ESBERIEH GARDEN.					
Gas	41 441 444		L.E. 34	6 758	
917		200	51	4 449	
51 1 1			78	3 790	
Native Band	** *** ***		30	2 ((0))	
Caris			4	9 165	
Stores, repairs, etc		460	10 . 60 )	2 030	
Cleaning cesspools	ww 845 940	104	11 2	5 852	
Т	otal		L.E. 2.38	4 044	
	dget		2.48		



# REPORT ON THE SURVEY DEPARTMENT

For 1903

BY

CAPT. H. G. LYONS,

DIRECTOR-GENERAL, SURVEY DEPARTMENT.



# THE SURVEY DEPARTMENT REPORT, 1903

# REVENUE SURVEY.

The Revenue Survey was carried on in 1903 in Qaliubia and Daqahlia provinces; the former was completed by July and the latter by January 1904. By the end of the summer a part of Qena Mudiria was begun and directly after the flood had subsided the whole province was taken up. In October the Finance Ministry notified that all village registers of Upper Egypt must be completed before the end of January each year instead of the end of March. This has made a great difference since under the first arrangement complaints could be investigated and errors corrected after the flood, but now all must be completed before it. To carry out this new programme an increase of about 50 surveyors will be necessary in 1904, and the two following years.

I would also draw attention to a point to which I shortly referred in the report for last year; (1) at present a survey is being carried out on a scale of 1:2500 which technically is as accurate as the European surveys of the same character, since the scale of permissible errors is the same as that allowed in the Austrian, French and German cadastral surveys. The correctness of the boundaries of individuals' holding is not so great since there is no law which requires a landowner to mark his limits, or to appear and point out his boundaries at the time of survey, but whenever they are indicated an accurate survey of them can be guaranteed. On this survey a sum of about L.E. 50,000 is being spent annually.

Copies of the maps when completed and printed are handed over with the land registers to the Ministry of Finance and are deposited at the Mudiria. Sales of land are constantly taking place, but there is no accurate system of keeping the maps, which were accurate, up to date; the surveyors at the Mudiria are not sufficiently trained to carry out the work, and I believe that there is no technical supervision to oblige them to do it correctly. Thus in a few months the map no longer represents the actual state of the properties, and the mutation register, being kept up from the data provided by these untrained employés, is

<sup>(1)</sup> Public Works Administration Report 1992, p. 852.

of no use in any revision of the map. Thus the yearly expenditure must go on indefinitely and before any province is revised, I suppose at least 10 or 12 years must pass. For probably the last five of these the maps will not be of much use.

I believe that for an average annual expenditure of L.E.2,000 per Mudiria these maps could easily be kept up to date and all official measurements for expropriation, etc., made; the periodical revision of maps and registers would be much quicker and cheaper since there would be a map corrected up to date. A cadastral office in each Mudiria would be necessary and they should be technically supervised in order to keep the work up to the necessary standard of accuracy. If registration of title is introduced some such arrangement will be necessary. It could be introduced now, as each Mudiria is finished without difficulty and without in any way delaying the work of the present survey.

In the Instruction Class 59 surveyors have been trained to fill the places of men who resigned or who were dismissed as not up to the required standard, 36 in number.

A considerable amount of work is done also in examining surveyors and draughtsmen for other administrations; in the 14 months ending February 1904, 33 were examined for the Government Lands Department, and 17 for the Sudan Government.

The technical library of the Department has increased considerably during the year:—

	Beaks and Pamphlets.	Maps.
In the Library 1st January 1903	2,656	731
Purchased	187	17
Presented	318	Sal
In the Library 31st December 1903	2,191	784

The sale of maps and publications which has been steadily increasing for some years past, increased very markedly during 1903, and a still further increase is probable in 1904 since small landowners will now be able to get copies of the maps they require from the survey parties working in their neighbourhood.

YEAR.	Printed majo	Publications.	Imeings	Tetal.
1 803 17	LE M.	L.E. N.	E.E. M	L.E. M.
1901	214 9	48 8	537 6	801 3
1902	2012 (1	90 2	628 9	1011 1
1903	874 6	122 3	721 2	1721 1

The Map Store has already to be enlarged and a sale room must be built where applicants can consult maps and purchase them.

STATEMENT OF PRINTED MAPS, RTC., IN MAP STORE.

		1	Melie	Publications including meteorological monthly sheets.
In Store 1st January 1903			216,095	91,063
A A A A A A A A A A A A A A A A A A A			323,068	74,740
	• •		135,888	32,352
In Store 31st December 1903			403,276	133,251

The issues have largely increased showing that a fuller use is being made of maps, both by Government Departments and by the public.

ISSUES.

				36 a	P8.	PUBLICATIONS.		
		YRAE	R.		Free (1)	On payment.	Fren (*)	Оп раушені
1901	460		•••	n + +	 24,580	2,847	9,009	235
1902		0 0 0		0.57	 88,086	4,137	15,847	801
1903		a 6 +		2 0 1	 122,817	13,071	30,004	1,648

<sup>(1)</sup> To Government Departments.

<sup>(2)</sup> Mostly monthly meteorological observations sent to Government Departments and to other Services and Observatories.

#### THEODOLITE TRAVERSING.

The improvement recorded in last year's report has been well maintained, though circumstances have tended to raise the cost. Communication in Upper Egypt is not so easy as in the Delta, and the alteration of the programme by the Finance Ministry, which has already been mentioned, has necessitated training 20 new traversers whose work is slow at first. The work done is shown in the following table:—

SUMMARY OF TRAVERSE WORK DONE IN 1903.

Notes of Martinga	troversed to to blaim.	Area tenterent tu up kilom.	Chalinne in kilom.	No. of trasare points worked.	No. of to the season of the season of	Portuga pertuga ng N2-sta	Protesta 24 T West Kings war 1	T-GI FreE	r set
Imphlin	110 112	A D(1)	0.0000					LL	185 11.5.
	116,113	188	1,736	5,125	1,1652	10-5	4+73	540	110
the talk	392,106	1.647	5.749	19,3880	2,647	11-7	7:27	25 (1,0)	165
Asmin	28,464	120	945	8,773	531	31=1	7-100	7111	1 -117
Girga	29,628	124	111	1.946	GPT (M. C.)	15*9	Nº A	337	1.73
Total	อเหนืกใน	2,879	8,807	30,150	4,444	12:7*	E-17.	3,6721	122*

<sup>·</sup> Average.

In comparison with previous years these data are:-

	1(0.1	[50.0]®	\$100 C\$
Cost per square kilom L.E.		1.708	1.540
Cilometres chained per square kilom	16	13.s 4·13	12.7
Average number of points per surveyor per day	6	5*5	6*75

<sup>·</sup> The figures given in last pear's report are incorrect and should be as now given.

The accuracy of the work has been consistently good. Considerable trouble was caused at first by the removal of marks, but this was

<sup>†</sup> The cost of Aswan does not include travelling and freight charges on the War Department bouts. ‡ L.K. 3,743 added which was actually spent in Qalinbin.

reduced by the local authorities, after a short time though a good deal of it still goes on.

#### TRIANGELATION.

During the year the major triangulation of about one-third of Qena and Girga, and of Aswan from Dakka northwards to Esna was completed, but the comparative want of economy of the method necessarily adopted in the Nile Valley (that of triangulating a strip of quadrilaterals connecting points on the escarpment on each side), was markedly felt. In consequence it was found impossible to complete the major triangulation from Dakka to the frontier. The Revenue Survey accordingly was based on the minor triangulation only in this district. The accuracy however, is more than sufficient for the wants of the Revenue Survey. In pursuance of the general plan \* bases were measured at Addendan, Dakka and Khattara. The measurement of the latter was only completed early in 1904, but since it falls more naturally into place in connection with the work of last year, it is referred to here. A base was also measured at Tema for the Girga triangulation.

Chiefly owing to the fact that the requisite staff of inspectors for using the Jäderin apparatus could not be spared at one time, it was decided to measure these four bases with the 100-metre steel tape already employed for the Fayum base, but experience with it seems to indicate that the risks of error with the wires are less than with the tape. The latter demands extremely calm weather for the best results, a state of things which it seems impossible to look for in Upper Egypt during the winter months when the tape can otherwise be most successfully

employed.

The base is subdivided into two or three sections of from 700 to 900 metres each which are measured separately. Each section is laid out in 100-metre lengths marked by stout stakes to which a fiducial mark is attached. Every 20 metres a light staff carrying a roller on the top is placed to support the tape. The tops of the rollers are carefully graded so that the slope from one stake to the next is preserved. In the actual measurement the distance from the ends of the tape-length to the marks on the stakes are measured and the tension and temperature read. The tape is then slightly disturbed and a new set of

<sup>\*</sup> See Public Works Ministry Report 1902, p. 856.

readings taken. These small distances were read in different ways at different bases, but the method found most successful was to nail to the stakes strips of zinc 30 centimetres long on which millimetre scales had been engraved.

During the year an error in the computation of the Gebelen and Ambir bases was discovered, fortunately in time to allow the necessary corrections to be made for ensuring the accuracy of the maps of Qena Mudiria, which alone was affected. The revised results for these bases are now \*:—

Gebelen		n d A		* *			102	2304 2323	
The cost of the major	triang	ulut	ion	Wills	-				
D								L.E.	И.
		0.6 4		900	***			1,303	870
			244				100	615	011
Measurement of bases .	** ***							148	
			Tota	al		0.04	I.s.	E.2,066	881

for which 4,100 square kilometres were triangulated.

# STATISTICAL DETAILS.

#### MAJOR TRIANGULATION.

	Daqahla Qalinbia.	Qena.	Girma	Ачин	Assiut.
Extent in square km. Time taken in days Stations occupied Lines observed Triangles Average length of side (metres) Cost L. E. Cost per square km. L. E. Cost per station L. E. Average error of closure of triangles	15.000 1.200 0.437 31.5	1,277 153 29 86 66 15,000 509 0,469 20,7 2″,19	1.441 165 21 48 46 16,006 612 0.425 20.1 3*.04	2.662 270 31 73 56 17.000 804 0.302 25.9 2".48	70† = = 216 =

<sup>.</sup> Cl. Public Works, Ministry Report 1902, p. 356.

<sup>†</sup> Recommissance only.

# MINOR THANGULATION.

Except in summer four parties were steadily at work. The area covered extended over half of Qena and Girga and the whole of Aswan.

The total cos	rt W	ms :-	_							1903
Personnel				 404	h 0. H	 ***	100		***	$\frac{1.460}{455}$
Transport Marks.			000	1 4 0		 		9-9-6	6.04	43
										1,958

for which an extent of 4,200 square kilometres was triangulated.

# MINOR TRIANGULATION.

	Quissa 1983.	Ofrica 1963.	Aswan 1903.
Extent in square km	897	1,141	2,117
Time taken (days)	307	366	155
Stations occupied	191	187	286
	351	470	725
Triangles	286	251	288
Average area in sq. kilom	3.2	3	5
Average length of sides, metres	3,200	3,000	4,5(H)
	439	751	659
	0.490	0.659	0.311
Average error closure of triangles		3" .2	2".5

The computation work has been similar to that of the previous year. Improvements in the methods of cheeking have, however, been introduced, so that every step of the work is now checked, either by computing backwards direct from the final results to the observed values where that is possible, or by independent computation where the other method is unavailable. The plotting of the map-sheets is further checked by a repetition of the process independently.

#### COMPUTATION OFFICE STATISTICS.

	[100]	11972	[ NIX
Points computed	4.3,0000	53,136	31,980°
Length of lines computed Kilom.	-	12,142	9,600
Sheets plotted	2,300	5,026	4,968
Area computed Fedd.	_	875,041	714,132
Villages computed	-	510	302
Total cost 1.E.	_	2,079	2,303
Cost per feddan	-	238	399

<sup>\*</sup> Exclusive of 2,000 points for the topographical work and town survey work.

The falling off in the area computed is due almost entirely to the effect of the Nile flood in stopping field operations; also the area given is the actual area inside the boundary lines of the villages as derived from the work of the survey and is not estimated as was the case in former years.

The number of points computed is less since in former years points on the village boundaries were computed twice, once in each village; as the work became more organised this extra computing, which was unnecessary, was avoided. The time economised in this way enabled the Computation Office to furnish all the taftishes with the areas of the villages inside the boundary lines, to be used in checking the area found from the sum of the individual holdings.

The astronomical computations for the almanaes were made as usual. There is evidence that as the Government Almanae is becoming better known its usefulness is increasing. Several additions were made to that for the current year which was published in November.

With the exception of the computers in the triangulation section, there is not a computer in the office who has had any previous mathematical training except in the elementary rules of arithmetic. Owing to the absence of any institution in Cairo where the requisite instruction can be obtained in the hours at the disposal of the employes of the Department, it has been necessary to train the whole of the junior staff, and in some degree, the senior also, in the office.

# FIELD SURVEY.

At the beginning of 1903 both Qaliubia and Daquhlia Mudirias were in hand, and both were completed during the year, the total area completed during the year being 752,000 feddans which is the largest area hitherto completed in any one year. Together with the increased rate of work, there has also been a steady reduction in the cost per feddan during the last two years, both in field and record work.

Y F XB.	thet of field work.	Cost of record work.	Total cost per 100 feddans.	
	Talk M	to.E. M.	India.	
1901	1 428	1 154	2 582	
1902	1 400	0 700	2 100	
1903	1 120	0 603	1 732	

This reduction of cost, as also the large area completed during the year, is partly due to the large areas of "barari" lands in Markaz Dekernis, and also to the 'Kharig-el-Ziman' lands in Markaz Nawa, Qaliubia.

On January 1st 1903, there were 91,000 feddans under survey in Qaliubia Mudiria, and by May the whole Mudiria was completed.

The total deficit in the Mudiria was not as large as was anticipated owing to the excess along the edge of the desert and in Kharig-el-Zimam lands referred to above, which balanced to a large extent the deficits which there would otherwise have been.

In Daqahlia Mudiria there were 248,000 feddans under survey at the beginning of the year.

The whole of this Mudiria was completed by the end of the year, that is to say the 248,000 feddans above mentioned were completed, and 402,240 feddans were begun and completed during the year.

The first villages in Qena Mudiria were taken up in September 1903 and subsequently the whole Mudiria, except 12 villages was taken up in the field before the end of the year.

Thus the area carried forward at the end of the year as partially completed, namely 337,952 feddans, almost exactly balances the area brought forward partially completed at the beginning of the year, i.e., 339,942 feddans. This bears out the figure given for the out-turn of the year, i.e., 752,000 feddans.

# STAFF EMPLOYED ON REVENUE SURVEY.

	FTAFF.			Revenue Survey.	Traverse Section
hief Engineers	***	÷ n •	 	 9	1
Engineers			 	 32	9
Assistant Engineers		100		 17	_
lessahin			 	 250	21
computing and Check	ing		 101	 250 28	_

# ARRAS SURVEYED IN 1903.

		1902/3		1908	1	1908-4	Total	
MARKAZ.	No. of Vilinger.	Feddans.	No. of Villages	Feddans.	No. of Vallagea.	Fedduns	Feddans.	Hennrks.
Dawahi Masr	12	14,603	1	1,403	_	-	16,006	
Qaliub	30	47,073	5	9,495		-	56,568	
Nawa	17	45,880	_	-	-	-	45,880	
Tukh	35	57,305	-	-	_	-	57,305	
Fareskur	21	36,675	3	13,399	***	-	50,074	ling.
Mit Ghamr	5	7,040	57	64,254	-	-	71,294	Areas given in column 1863-t are approximate only.
Mit Samannud	-	_	67	71,726	_	-	71,726	ximal
El Simbellawen	22	36,267	35	63,407		-	99,667	nichre
Mansura	51	69,888	2	2,497	-	-	72,385	1
Dekernes	15	21,990	57	183,226	-	-	205,216	ERES-1
Shibin el Kom	1	3,228	-	-	-	-	3,228	
Kafr Sagr	-	-	-1	3,732	_	-	3,732	n con
Deshna	-	-	-	-	15	60,517	60,517	News I
Esna		-	-	-	17	47,037	47.037	3 888
Luxor	-	-	100	-	16	68,922	68,922	A
Nag Hamady	-	-	-	-	19	49,814	49,814	
Qena	-	-	-	-	20	51,029	51,029	
Qua	_		_		27	60,633	60,633	
Total	-	339,942	-	413,139	-	337,952	1,091,033	

- 307 Time and Cost of Revenue Survey per 100 Feddans.

MARKAZ		No. of Villages.	Peddine	pur los	nya feddans.	Cost per l	00 feddans.
HARRAZ		Z	Ar Pen	Field Work.	Repords.	Field Work.	Hocords.
						L. 41. M.	L.E. M.
Nawa		17	45,880	26	1.2	0 637	0 287
Dawahi Masr		13	16,006	5:3	2:5	1 232	0 402
Qaliub	111	35	3(5,568)	591	2.8	1 051	0 502
Tûkh		35	57,305	7:3	5.5	1 594	0 670
Mansura ,		53	72,385	41	2.4	0 944	0 425
Dekernes	1 0 0	72	205,216	3 6	1.6	o 737	0 239
Fareskur		24	50,074	4.7	20	1 065	0 342
Mit Ghamr	- • •	62	71,294	6.4	5.2	1 278	0 799
Mit Samannud	* 4 4	67	71,728	3'4	24	0 849	0 499
El Sinbellawen		57	99,667	5*5	1.4	1 156	0 275
Shibin el Kom		1	3,228	8:4	14.1	1 875	1 895
Kafr Saqr	- * •	1	3,732	4:3	3.4	1 447	0 299
							-
		Ave	orage	5.02	3.80	1 150	0 553
Ave	Lutte	e in 1	902	5-92	501	1 400	0 700

AVERAGE SIZE OF PLOT.

MARSAZ	Number of	Total	Plote under 12 qirate.	Properties Space.	Plote ander 5 feddans and ever	Percentagu.	Flots over 5 feddam.	Peper littiger.
Etsa	3	1 40,080	15,655	39°1	21,072	5211	3,353	8:3
Fayum	9		18,474	46.8	18,781	47.6	2.214	56
Sannures	2		20,412	44'8	22,443	49:2	2.721	(5^()
Cristian Co.								
Shibin el Kom	101		22,431	381	35,128	59%	1.345	2:3
Menuf	5		21.158	341	39,478	6355	1.471	2.1
Quesna	(i		10,499	27.6	24,718	650	2.788	7.4
Ashmun	3		11.233	35.8	19,049	GUT	Lusu	3-5
Tala ··· ···	3	5 53,767	18,965	35.2	32,515	605	9,287	4:3
3.7	4	1 25,976	9,589	369	14,545	5631	1,842	7:1
Nawa	4		1,667	34.2	2,522	52-2	641	13.3
Dawahi Masr		4 4,830 5 17,560	4,653	26.2	11,235	6441	1,672	915
Qaliub		9 40,417	16,452	40.7	21,849	54.1	2.116	5.3
Tukh		311, 211	10,402	-3() (	#140mm	17.6.1	Au 8 2 11	
Dekernes	7	2 51,002	20,634	4014	26,692	5212	3,766	7:4
Fareskur		11,109	3,483	31:3	5,551	50%	2.075	18:7
Mansura		3 25,090	7,625	30.4	15,315	6130	2,150	8%
Mit Ghamr		35,819	10,672	29.8	21,769	6008	3,378	9.4
Mit Samannud	1	25,073	6,542	26.1	16,248	64.8	2.283	5.1
El Simbellawen		83 35,828	9,397	26.2	21,725	60.7	4,706	13.1
								1.0
Embaba		32,891	9,852	30.0		03°1	2,267	6.9
Giza		12,765	1	27.8		55.0	2,078	16:3
Ayat		17 15,385	1	1	1	46.8	530	5.4
Saff		26 20,868	6,803	36.2	12,925	61.9	1,140	5.2
								-

Besides this large scale survey primarily for revenue purposes an attempt has been made during the past few years to produce topographical maps of Egypt on scales of \(\frac{1}{10000}\), \(\frac{1}{20000}\) and also a general map on the scale of \(\frac{1}{200000}\). The sum allotted has hitherto been but little, though Government Departments are constantly asking for these maps. Certain portions have been surveyed with funds provided by the Irrigation Service, but this is most uneconomical, as survey parties are being moved from point to point to take up different areas at short intervals of time, and thus both time and money are wasted.

The area is revised in the field for publication on the scale of \( \frac{1}{10000} \) and from these the \( \frac{1}{20000} \) sheets will be reduced. The following table shows a creditable result for the small staff of 18 young Egyptian surveyors, all of whom have been trained in the Department, under Mess:s. Dowson and Weldon, the inspectors in charge. At the present rate it will be a long time before Upper Egypt gets any topographical maps and unless more funds are allotted to this work.

TOPOGRAPHICAL REVISION IN 1903.

PROVINCE.	No of image dome- in the year	Area of imp on eq. km.	Fotal asm try test in eq kin	Men working days.	Work- ing days let map.	ed him let working day	Total cost in LE	Cost per sq kilm
Beliera	450 Llexe	25 24 19-2	1,295 3,600 153,6	955 2,539 124	19.5 16.9 15.5	1.28 1.42 1.24	692 1.290 135	0.585 0.332 0.876
Total	ঞ্চল		4.973	3,61×		1,37	2.007	0,412

<sup>·</sup> Calculated as 150 full sheets but more actual sheets were supplied.

Towns finished in survey before end of 1903.

NAME OF TOWN	No. of tra- verse tearls	A. Close Town.	B. Open Town.	C. Country.	Town area (A+B)	Traverse marks leer Sq. kil. of town area.	Total	Cost per square klom	No. of men- work- ing days.	Work- ing days per equare kilote.
		60. 11.	eq. M.	sq. N.	94. M.		L. E.	fa. H.		
Suest	_	-	_	-	-	-	134		247	-
Helwan	85		-	-	-	-	43	-	78	_
Mis Ghamr	205	2,141,240	108,140	184,030	399,380	637	132	430	247	7117
Mansura	815	832,803	739,405	383,578	1,572,968	382	395	253	1,144	724
	_							-		
Total	1,245						707		1,716	

N.B.-Sucz and Helwan were only partial surveys.

Drawing Office. — In the Drawing and Lithographic Offices work has been carried on similarly to last year. The cost of authographing and printing a revenue survey map sheet about 44 cm. × 48 cm. is

Tracing, writing, correcting	 	- m m				325	Mill.
Transferring, proving, printing	 0.01					50	9-9
Muterials including zine sheet	 0.04	100	1 0 0	4.01	* * *	241	4.5
		Tota	al		2 4 4	465	Mill.

Paper is not included, as the number printed varies considerably according as parts of one or more villages occur on the same sheet.

The cost is slightly less than last year.

The topographical maps are fair drawn from the revised field sheets and then lithographed and printed in 3 or 4 colours.

The cost of the production of these sheets is as follows:-

Topographical 1000

	Behera.	Gharbin
Drawing Office.	ns / in	ui /w
Drawing	2571	3336
Lithographic Office.		
Lithographing	1210	1505
Printing Office.		
Proving	2599	3517
	6380	8418
Single sheet	42.5	42

This cost is rather above that reported last year, but is a more correct estimate, as it includes several small items which could not be accurately included in last year's estimates.

The preparation of 1 sheets is in hand, but want of funds prevents their publication at an early date. They are reduced by

photography from the  $\frac{1}{10000}$  sheets to  $\frac{1}{30000}$ ; blue prints on this scale are then prepared and these are drawn up for final reduction to  $\frac{1}{300000}$ .

The staff of the Drawing Office was :-

	European.	Egyptian.	Total.
Superintendents	 1	1	5
Lithographers	 -	18	9 18 8
Draughtsmen, 1st class	 5	9 7	11
Printers		3	7
Assistant photographers	1	2	1 2
Boys	 1	7 2	8
Total	21	68	

## STATEMENT OF MAPS AND PLANS PRINTED.

Number. 4,328 1,331 168	259,680 33,275 29,600
1,331 168	33,275 29,600
168	29,600
4870	0 .00.1
23	4,650 33,190
17	13,500
_	247 927
17	150,000 6,560

The geological staff were employed on measuring the discharges of the Upper Nile at Khartoum and Dueim, and each inspector was occupied in this work for about five months. In the remainder of the year Mr. Barron revised the geology of the country between Cairo and Suez, while Mr. Beadnell continued collecting the fossil remains from the Upper Eocene beds near the Fayum. Dr. W. F. Hume was fully occupied with the arrangement of the Museum collection.

During the year reports on a part of the Eastern Desert and on Baharia Oasis have been published.

An arrangement has been concluded by which the Trustees of the British Museum will include in the monograph they are about to publish, full descriptions of the Eocene Vertebrata which have been collected during the last two or three years from the desert north-west of the Fayum. By this means the whole of the material both in Cairo and in London will be described in the same monograph. Dr. C. W. Andrews has been detailed by the Director of the British Museum Natural History Department for this work.

Meteorology.—New stations were equipped during the year at Mongalla and Ghaba Shambe on the Bahr-el-Gebel, at Wau on the Bahr-el-Ghazal, at Doleib Hilla and Nasser on the Sobat and at Abbassia Hospital to preserve the continuity of the observations there when the Observatory is moved to Helwan. Rainfall stations were established at nine places in Behera Province.

It may be useful to mention here the present position of the meteorological services in Egypt and the Sudan at the end of 1903.

1st Order Station.—Fully equipped with self-recording instruments for registering continuously all meteorological phenomena. Abbassia Observatory, Cairo.

2nd Order Stations.—Recording atmospheric pressure, temperature, humidity, minfall, wind by means of observations taken twice or thrice daily.

EGYPT.

Alexandria Abbassia Military Hospital

Port-Said Giza Assint Aswan

SUDAN.

Wadi-Halfa Suakin Berber Khartoum Wad Medani Dueim

Mongalla

Climatological Stations.—Recording temperatures, humidity, rainfall, wind.

EGYPT.

Beni-Suef

SUDAN.

El-Obeid Kassala

Wau Doleib Hilla (American Mission Station)

#### ABYSSINIA.

#### Addis Abeba

Rainfall Stations .- Recording rainfall and wind.

### EGYPT.

Mersa Matruh Mex

Teb-el-Barud Damanbur Abu Hommos Kafr Dawar

Hosh Issa Atfih Shubrakhit Kafr Bulin

Khatatba

#### SUDAN.

Gallabat Erkowit

Gedaref Khashm-el-Girba (Athara)

Kodok Nasser.

Ghaba Shambe

The observations of first and second order stations are printed monthly, and the others annually.

### ABBASSIA OBSERVATORY.

In view of the transfer of all the instruments at the end of the year to the new site at Helwan no new work was undertaken during 1903. The self-recording instruments worked satisfactorily throughout the year. The noon Time signal was sent regularly each day by the Standard Mean time Clock, and the Time Ball at Port-Said was dropped by it. At Alexandria the mast of the Time Ball on Kom-el-Nadura broke early in August and by the end of the year it had not been repaired. The Time Ball signal at this port was not, therefore, given automatically during this period.

### LABORATORY.

The work of the Laboratory may be devided into four main branches:—

(1) The chemical analysis of various articles for purity, value and

conformity to specification;

(2) The physical examination of cements and hydraulic limes for tensile strength, soundness and fineness of grinding, and the examination of bricks and building stones for crushing weight, etc;

(3) The testing of scales and weights;

(4) The systematic testing of the public gas supply of Cairo for pressure, purity and illuminating power, and the examination of various burners for consumption of gas and intensity of light.

In addition to the actual chemical and physical examination of samples a certain and a growing, amount of consulting work is also done, technical opinion being frequently asked by various administrations on special points.

In 1903 a total number of 561 samples were examined as compared with 362 samples in 1902 being an increase of 55%. In addition to

this the gas testing was entirely new work.

1. Chemical Section.—During the year 288 analyses were made as against 225 in 1902, an increase for the year of 63 samples or 28"/o. Of these analyses 195 samples (67°/o) were done for the Public Works Ministry for which no charge is made; 42 samples (14°/o) for other Government Departments, a nominal fee being charged in each case; and 51 samples (17°/o) were received from non-government sources for which a regular tariff is in force.

Among the articles submitted for analysis were 28 samples of well water from various parts of the Delta, all of which were either in actual use or suggested for use as drinking water. Of these only one sample was of really good quality and this was from the edge of the desert on the outskirts of Cairo. Two other samples, however, were passed as potable, although both of them were inferior to a good average sample of Nile water. Thus 89 % of the well waters examined were quite unfit for drinking. In some cases the water was simply too salty to be used, but in many cases the water was badly contaminated organically and little better than dilute sewage.

Signal instances of particularly impure waters were (a) samples of water from a sakia and also from a so-called artesian well at Damanhur, and (b) from a well at Zeitun. The one sample of excellent water was also from Zeitun.

2. Physical Section.—A total of 111 samples of cement and hydraulic lime were examined for tensile strength, etc., as compared with 113 samples in 1902, being a decrease of almost 2.0/a; while 162 samples of brick and building stone were tested for crushing strength, etc., against 24 in 1902.

<sup>.</sup> The unalysis is a chemical one only and not banteriological.

The greater part of these 162 samples, however were typically examples of the various Cairo building stones which were examined for the Geological Museum, so that a full description of each stone might be exhibited with the specimens.

- 3. Weights and Scales.—Weights were examined on several occasions for the Railway Administration and a weighbridge belonging to the War Office was thoroughly tested with various loads from 25 to 500 Kil.
- 4. Gas Testing.—At the beginning of the year a complete set of new apparatus exactly similar to that used at the present time in the Paris gas testing stations was received and erected, and regular and systematic testing was commenced.

From April to December inclusive the gas was examined on 184 different nights.

In April, the first month during which regular testing was done, the mean illuminating power for the month was found to be 19.5% below that specified in the contract.

As soon, however, as this was brought to the notice of the Company a considerable improvement was at once made, with the result that in May the illuminating power was only  $6.9^{\circ}/_{\circ}$  below the contract. In June, July and August the illuminating power was  $6.1^{\circ}/_{\circ}$  10.3°/ $_{\circ}$  and  $4.2^{\circ}/_{\circ}$  respectively below the standard, but in each of the succeeding months from September to December inclusive the illuminating power was slightly in excess of that specified.

On three occasions sulphuretted hydrogen, which is prohibited under

the contract, was found to be present.

The recorded pressure has always been above the contract requirements, which, however, are fixed very low, except occasionally when

the gas has been turned off for a short time.

In December the Gas Company brought out as an independent expert, the chief inspector of the gas service in Paris. This expert, with the permission of the Government, examined the apparatus in use in the Government Laboratory and checked the methods of testing employed, and both he and the Company expressed their entire satisfaction with the manner in which the tests were performed, and also excepting on two very minor points, with the apparatus used, which is exactly similar to that employed in Paris and is supplied by the same makers.

Incandescent Lighting.—In addition to the regular testing of the gas for conformity to contract requirements much other work has been done

on the relative values of the light produced by different incandescent burners and mantles, and also on the intensity of light emitted by incandescent mantles in various stages of efficiency, in order, if possible, to arrive at some satisfactory method of classification that would be of practical use during the nightly inspection of the street lamps by the Gas Service.

The following tables show in detail the amount and nature of the work done during the past twelve months:-

Section.	No of samples examined.	Fees meetved.
		L.E. M.
(hemical Section	288	49.800
Physical Section	273	36.633
Total	561	86.433

		of examined	From provident.		
Frem	Chemical Section.	Physical Section.	,		
Public Works Ministry : -					
Survey Department	91	150 (			
Tanzim Department	52	11			
Irrigation Department	43		No charge.		
Department of Antiquities	9	- 1			
are just this or a little the			L.E. M.		
Ministry of War	15	_	3.000		
Railways Administration	17	_	3.400		
Wakfs Administration	_	3	0.300		
Sudan Government	9	_	5.000		
Army of Occupation		-	2.000		
Non-Government Sources		109	72.733		
Total	288	273	86,433		
Fotal	2.00	21.0	11.0 2.217		

	Nº of sample	e ennimit		
Nature of sample.	Chamical Section.	Physical Section.		
Ores, minerals, etc	10	_		
Building stones and bricks	—	162		
Coments and hydraulic limes	34	111		
Paints	3 7 20 28	-		
Asphalts	d swi	_		
Lubricating oils	20	_		
Drinking waters	35	_		
Drainage & irrigation waters	43	_		
Manures	12			
Foods (butter, etc.)	15	_		
Miscellaneous	44	-		
_				
Total	288	273		
Number in 1902	225	137		

#### GAS TESTING

Month			Month No of nights illuminating power tested.						
April			***	200	24 18	72 54 60			
May June		* * * *			20	60			
July August	***	***	***		20 20 20 20 23	60 60			
September Jetober					20	60 60			
Voyember			***	***		69 57			
December				***	19				
	T	otal	• • •	***	181	552			

The investigation, begun in 1902 on the soil and water of the Wadi Tumilat lands under reclamation was continued in 1903, but owing to the pressure of the routine analytical work, which increased 55°/, during the year, it was found impossible to do more than examine a few samples of soil and once a month a sample of the drainage water from the Kassassin pumping station.

One of the samples examined was a heavy clay found to be practically untillable; samples of this were taken from the surface and from depths of 20 cms. and 30 cms. respectively below the surface: in no case did the sodium carbonate amount to more than 0.8 per cent, but

even this small amount was sufficient to make the soil sticky and to account for the difficulty experienced in working it.

The following were the results obtained:-

Laboratory No	Depth	Muisturn	Sodium	Section to the state	riodium chloride
		96	96	40	96
236 237 238	surface. 20 cms. 30 cms.	8.75 9.61 9.31	0.08 0.05 0.02	0.42 0.21 0.35	0.20 0.08 0.03

The use of lime or limestone was recommended, or, if these were found too expensive, sand was suggested. Any one of these three materials would render the soil more open and porous and hence lighter to work and more easily drained.

The percentage of injurious salts in the drainage water from Kassassin was practically the same in 1903 as in 1902. The details are given in the following table:—

PARTS PER 100,000.

			1902				1903			
Мовтн	Matter to Solution	Fortium Observe	Sulphare	Sodium	Sections Ricarbonate	Matter to Sofution	Rodium	Softun	Sedimn	Solum
Junuary	-	-	-	-		11912	53100	33-73	nil	T-9 + (419 -7 m - 7 m
February	-		-	-		149-2	54+56	BH+39	nil	57:12
March	116**	15:71	23.82	nil	-	152*4	66102	35:07	wil	67:20
April	195+6	15127	33.61	nil	-	127-2	10:37	25-74	nil	150 - F 15
Мау	120710	70.39	85+65	tenin	-	117:6	15-92	27 % 4	titl	6131m3
June	131-2	69-77	40:79	trace	-	12~0	83178	320,60	6+36	32190
July	11014	44153	29:10	mi	-	121-2	401140	28+13	nil	681+365
August	9512	357 t 84 t	49.0 c ( \$40	Imani	-	\$005 m m	34180	21:48	nil	57:12
September	261-11	20 - 55	23101	trace	-	81:2	31-32	17:96	mil	52*08
October	9716	33 - 29	99+9 <sub>9</sub>	I tares.	-	56.2	32-48	21.37	mil	52106
November	Q0+10	.34: *74	26*43	trace	52°08	81-2	29*00	17:29	nil	52*Da
Imember	101.2	37:89	21.56	nii	61 - 32	8718	38128	16:32	nit	4561 * 4.36
Mean	1496*6	12*37	28.23	-	56.10	112:3	44190	26150		38-31

It has been a year of great pressure of work in the Department and Messrs. Humphreys and Craig, Chief Inspectors, and Mr. Hansard, in charge of the Drawing Office, have had much difficulty in keeping the out-turn up to the increased requirements; the Inspectors in charge of Survey Taftishes have all done very well and have improved both the quality of the work and the amount, though local interests often greatly increase their difficulties.

During the summer of 1902 instructions were received from the Ministry that in future the records of all Nile gauge readings, south of Aswan, should be kept by the Survey Department. Measures have been taken to systematise the taking of gauge reading as far as possible, and there has certainly been an improvement; counterfoil observation books have been provided and the readings are forwarded weekly, and on receipt, are printed and circulated.

The gauges which exist at present are:-

Nile	1	Wadi Haifa Berber	masonry gauge Records from 1891 temporary 4th May 1300 *
Blue Nile	1	Atbara Roseires Sennar Wad Medani Klurtoum	on masonry river wall †
White Nile	}	Dueim Taufikia	temporary iron plate gauge inclined teak gauge
Sahat	}	Nasser Doleib Hilla	inclined teak gauge
Buhrmel-Jehrl	{	Ghalm Shaml Mongalla Gondokoro	vertical iron plate gauge inclined teak gange

Most of these gauges have been moved from time to time, so it is desirable that the changes should be recorded.

Wadi Halfa.—A masonry gauge built in 1890 and not changed since its zero is at R.L.

Berber.—A temporary gauge.

Athara.—A temporary wooden gauge unsuitably placed.

Khashm-el-Girba.—A gauge cut in rock by Mr. C. E. Dupuis in April 1903.

Khartoum.—A masonry gauge on the river quay wall near the works Department. According to the levels of the Sudan Railways the zero of the gauge is at 1213 ft. = 369.71 metres (very approximately) above Suakin sea level.

<sup>.</sup> Also during the floods of 1881 and 1882.

<sup>†</sup> Also during the floods of 1869-1883.

It was temporarily moved in June 1903, during the building of the river wall, to a point not far off, but the level was carefully preserved and consequently no correction is required to the readings.

At Roseires is a temporary gauge which has been more than once disturbed. It is an iron vertical gauge placed in a sloping bank. It is 2 metres long and is movable as river rises and falls; there are two bench marks to control any movement, one reads 3.70 the other 7.05 metres.

Its zero is now inconveniently high and minus readings occur from the middle of March until June.

Sennar.—A similar gauge to that at Roseires, but without a bench mark.

Wad Medani.—A similar gauge to that at Roseires, its two bench marks read 4.00 and 10.00 metres.

At Dueim, 320 kilometres south of Khartoum, a temporary wooden gauge was erected in 1900. In April 1901 three lengths of a wrought-iron gauge were creeted at 3 points on the sloping bank. During the autumn of 1902 one of these was knocked down and lost. It is proposed to build a masonry gauge at this point, but it has not yet been done.

At Taufikia 830 kilometres from Khartoum and just below the junction of the Sobat with the White Nile a wrought-iron gauge was fixed in April 1901, but in 1902 this gauge was moved to Fashoda where it was for some months in use.

In 18th April 1903 a new gauge was fixed. This was made of two 4-metre baulks of teak each of which were anchored back into the bank with teak trestles, so as to lie approximately flush with the bank and so be protected from boats, hippopotami, &c. The upper surface is divided metrically, a brass mark being placed at each 5 centimetres. When in place the angle of slope is measured and the reading on the scale is converted to the vertical by multiplying it by the sine of the angle of slope. At Taufikia a second sloping scale was erected above the first as the rise of the river was greater than could be recorded on one. The correction factors for these are 0.438 and 0.514.

A similar gauge was crected at the American Mission Station at Doleib Hilla at the end of April 1903, and in May Captain Wilson fixed a similar one at Nasser. In September 1903 a temporary wooden gauge was fixed at Ghaba Shambe which will be replaced by a wrought iron one. Correction factor for Doleib Hilla 0.590. At Mongalla on the Bahr-el-Jebel a teak sloping gauge was fixed at the beginning of April 1903 and has been regularly observed ever since. Correction factor 0.701.

At Gondokoro gauge readings exist since 1900, but the gauges have been lost or moved on several occasions. A sloping teak gauge was fixed on the 9th April 1903 and since then this has been regularly in use. As there is no little confusion in consequence of the various changes, the following history of this gauge is given.

Observations were commenced here on 6th December 1900 after those which had been taken further up-stream, at Fort Berkeley from 1st September 1899 to 2nd December 1900 were discontinued. The gauge was a light wooden rod graduated in feet and inches. This may be called gauge A.

On 27th March 1901 a more substantial gauge of sheet iron screwed to a wooden upright which was strutted from the bank was fixed at the time of Sir W. E. Garstin's visit. \* This may be called B and was divided into metres and centimetres.

On the 13th November 1902 this was knocked down in the night and lost, and another, C, was erected on 18th November 1902 which was graduated in feet and inches.

To avoid the uncertainty caused by such frequent changes of gauge, on 9th April 1903, a sloping bank of teak was fixed parallel to the slope of the bank and firmly anchored back into the bank, so as to be out of the way of boats and hippopotami. This bank is graduated metrically and has a mark at each 5 centimetres. It is fixed at a slope of 60° so that its readings require to be multiplied by 0.866 to reduce them to vertical metres.

These changes may be tabulated as follows:-

Gauge	18	is usu				
	from	t.o.	READENG.			
A. B.	6.12.00 28.3.01	27.3.01 12.11.02	Feet and inches.			
C.	18.11.02	8.4.03	Metric.  Feet and inches.			
D.	8.4.03	to date.	Metric.			

<sup>.</sup> See Blue Book Egypt No. 2, 1901.

Thus there has been a constant record, except from 13th to 18th November 1902. The correction of these different series of gauge readings with one another is therefore most important.

On the 9th April D gauge was erected and read 0<sup>m</sup>48 or 1 ft. 7 in. while the C gauge which it replaced read 4 in., thus the readings of C gauge require an addition of 0<sup>m</sup>38 to reduce them to those of D gauge.

A difficulty arises now in connecting B gauge with C in consequence of the interval of 5 days between the loss of B gauge and the erection of C gauge.

The recorded readings converted to metres are as follows:-

1	902												metres
10	November		-		,					•	•	0	1.37
11	2.7										۰		1.42
12	22			-	-	ь							1.50
13	52	P			4		-9						_
14	22				-				4			4	_
15				۰		۰						a	_
16	**				4			-					_
17	9.0		•	٥	d		ъ		0		+	•	_
18	*9												0.86
19	4.0									6		٠	0.84
20	22				4						4		0.84

Thus to reduce the B gauge readings to the C gauge the correction will be 0<sup>m</sup>64 if there was no fall or rise in the river between 12th and the 18th of November.

Mr. Westry, who was the observer, has stated that he believes the river was stationary between these dates, but no note was made at the time. On the 28th March 1901 B gauge was fixed and read 0<sup>m</sup>30 when A gauge was reading 1 ft. 6½ in. thus the correction to correct its readings to those of B gauge is 0<sup>m</sup>16.

These corrections are given in the following table:-

		CORNECTIONS 1	TO BRUCCE TO	
GAUGE.	A.	В,	U,	1).
Α.	0	-0°.16	-0=.80	-()m,42
В.	+0=.16	ō	-() <sup>m</sup> ,64	-0.26
C.	+0=.80	+0m.64	0	+0m,38
D.	+0ª.42	+0=.26	-(P.38	0

There is no reason to believe, however, as stated above, that the river must have fallen in the interval between gauges B and C. The amount of the fall necessary to render the discharges which were taken in 1901-2-3 consistent, is 0<sup>m</sup>287. Since the river is falling in general in November, it is probable that its level was not maintained constant between gauges B and C. Moreover observations made by the flood discharge party in 1903 at Mongalla, Lado and Gondokoro show that the difference in level between the 1902 and 1903 floods was about 0<sup>m</sup>90, whereas the difference on the gauges is 1.24; thus additional correction of about+0<sup>m</sup>30 to gauge-readings on B and consequently A is thereby indicated.

H. G. LYONS,

Director General Survey Department.

## REPORT ON THE TECHNICAL DEPARTMENT

1903

BY

MD. ANIS PASHA,

CHIEF OF TECHNICAL DEPARTMENT.



### TECHNICAL DEPARTMENT

### YEARLY REPORT, 1903

### STEAM ENGINE SERVICE.

The work of the Steam Engine Service during the year 1903 was again satisfactory. The demands for Rokhsas were examined and either sanctioned or refused without any delay beyond what was necessarily occasioned by the ordinary procedure and routine of the Service, and the inspection was carried out without much of the former antipathy and evasions on the part of the owners, whether native or foreign.

Many of the owners have not only realised the necessity of keeping their plant in conformity with the conditions of safety laid down by the law, but have also recognized that it is to their benefit and interest to keep them in that state. Mr. Crawley, who has always tried to induce them to interest themselves in their machinery, reports some considerable progress in the general condition and upkeep of the engines and boilers, and a distinct improvement in the way they are now used and treated by the drivers, although as yet far from satisfactory.

The number of applications for Rokhsas for Industrial Engines received during the year 1903 was 359 as against 290 in the previous year. This number, together with 64 applications remaining for further consideration from 1902 and 35 received from the different Mudiriehs for permits to allow irrigation pumping engines to be also used for industrial purposes, makes a total of 458. Of these, 362 were granted and 96 remained under consideration at the end of the year.

233 engines out of the 362 granted Rokhsas were submitted to the regulation, examination and test and having proved satisfactory, were given permits to work.

This number with 1056 sanctioned to work up to the end of the year 1902, makes a total of 1289 industrial engines working in conformity with the law up to the end of December 1903.

The number of visits of inspection made by the staff of the Service was 750, 233 for the above mentioned newly licensed engines, and the rest, 517, for either examining the machinery or testing the boilers of older established engines.

Besides the above, many irrigation pumping engines were also visited, either on account of complaints received, or at the request of the Inspectors of Irrigation.

I mentioned in my last report that the Steam Engine Service was called upon by the Inspectors of Irrigation on several occasions to examine or test old pumping engines complained of as being dangerons or in very bad repair, and that some of these engines were found in such a dangerous condition that the Service was obliged to stop them administratively after obtaining the consent of the Irrigation Service. I also remarked that Art. 6 of the Decree empowers the Service to examine and inspect all irrigation engines, and to prescribe to them any conditions it may deem necessary for the jublic safety.

In 1903, these calls for examination and test have considerably increased, and many of the engines inspected were found in a very had and uncared for state and had to be stopped, either for repairs, or as unfit for use. Also, as soon as it became known to the public that the Technical Service was also dealing with the irrigation engines, many complaints were made against them, and engineers had to be sent to almost every part of the country to examine into the subjects of these complaints and report upon them to the Service upon which the necessary actions with respect to public safety are taken.

The deplorable state in which many of these engines were found, and the inconvenience caused by this cumbersome system, suggested the expediency of taking immediate steps to bring them under the direct control of the Steam Engine Service, and to a certain extent subject them to the same regulations with respect to public safety as the engines in industrial establishments are now subjected to.

But as so much of the prosperity of the country depends upon these engines and no wholesale action can possibly be taken against them, any proposed change in their present state should necessarily be effected gradually and cautiously.

It was consequently arranged to deal first with the engines requiring new Rokhsas or old Rokhsas renewed and bring them at once under the control of the steam engine law.

The engines already established and duly licensed will have to be left to the care of the Service with the help of the irrigation officers to be dealt with in the way they have been during the last two years, and so get them improved bit by bit till in time all the dangerous ones disappear and the others come under proper control.

In dealing with the newly licensed engines, it has been arranged that from the beginning of 1904 all Kokhsas for portable as well as for fixed irrigation engines must, after the consent of the Inspector General of Irrigation concerned, be issued from the Technical Service only and that even no temporary permit to work any engine shall be

given without the intervention of the said Service.

Moreover, the Technical Service, by taking full advantage of Art. 6 of the steam engine law issued on the 5th November 1900 above mentioned, will insert in every Rokhsa issued or renewed the conditions of safety laid down by the said law, and deal with the engines, as far as public safety is concerned, in the same regular procedure as the engines in industrial establishment. Thus, no engine with a new Rokhsa or with an old Rokhsa renewed will, in future, be allowed to work before it is thoroughly examined and its beiler tested and pronounced in a safe working condition.

By this means, we shall not only be sure of the newly licensed engines, but also a stop will be put to the great abuse now practiced of buying old boilers which the Service had condemned as unfit for use in industrial establishments, such as mills, etc., and using them for irrigation purposes, simply because there has been no technical

inspection of irrigation engines.

Also, as the Rokhsas will be registered in the books of the Service the owners will be directly under our control in matters of contravention and can easily be dealt with according to the law.

During the year the Service was more than once asked to examine and report on river steamers, but could not comply owing to the Decree of the 5th November 1900 having no provision for steam boats. A special project, therefore, is now being prepared by the Technical Service with the intention of its forming a part of a General Layha for river navigation which the Ministry of the Interior is desirous should be put into force.

The number of proces-verboux of contravention drawn up against engine proprietors during the year was 49, of which 41 were submitted to the Native Courts and 8 to the Mixed Tribunals.

In the Native Courts 11 proprietors were sentenced to stop their engines, 2 were fined and one was acquitted. Of the remaining 27 cases, one was withdrawn by this Service and 26 were still in court at the end of the year.

In the Mixed Tribunals 6 proprietors were condemned to stop their

engines, and 2 were still awaiting trial at the end of the year.

From the above it will be seen that the judgments in both Courts were on the whole very satisfactory. This is owing to the Layha being better understood and the cases better pleaded by the Parquet.

Three boiler explosions took place during the year, one at Dishna, another at Minia, and another at Corashia.

The explosion at Dishna was a very serious one, causing the loss of 4 lives and serious injury to 3 people.

This boiler was very old and its proprietor was warned of its bad state by the Service which ordered him not to use it until it was thoroughly examined and tested. He, however, took no heed of this order and worked it without the knowledge of the Service with this unfortunate result.

On examination of the boiler at the scene of the explosion the cause of the accident was found to be excessive corrosion from old age.

At Minia, the explosion was of the boiler of an agricultural locomotive 31 years old belonging to the Société des Sucreries. It occasioned the death of two persons and badly injured one.

Owing to all traces of evidence being removed from the scene of the explosion the exact cause could not very well be ascertained, but as it appeared that the loads on the safety valves were not altered to suit the great age of the boiler the explosion was undoubtedly due to over pressure.

At Corashia the exploded boiler was a Cornish one that supplied steam to an irrigation fixed engine. The explosion was due to shortness of water, and caused the death of the engine driver.

40 Rokhsas for irrigation fixed engines were given from this Service during the year; 29 for new stations and 13 in exchange for old Rokhsas. The fees received for these Rokhsas came to L.E. 348.500.

The total number at the end of 1902 was 816. Of these, 14 were cancelled and 803 remained. This number with the 40 new Rokhsas, make the total number of Rokhsas in hand at the end of the year 842. Their distribution among the different irrigation Circles is as follows:

		In hand to end of 1002	Cancelled in 1903	Given in 1943	In hand to end of 1903
Ist Circle	***	226	6	13	233
2nd ,,		320	3	11	328
4th		105	-	1	106
5th	***	130	2	7	135
Giam Diameters		24	-	-	24
Delta Barrage Directorate		8	1	2	5
Assyut Barrage Directorate			2	4	ā
2 miletinger	***		_	2	2
		816	14	40	342

The staff of the Steam Engine Service is totally inadequate for the heavy and increasing duties it is now called upon to perform, and in spite of the continuous efforts of Mr. Crawley and his assistants, I feel that before inspections and tests can all be efficiently and expeditiously carried out, it is absolutely necessary that the staff should be increased.

Great praise is due to Mr. Crawley for the manner in which he and his small staff have carried out the work of this Service during the year with such satisfactory results.

### QUARRIES SERVICE.

The total number of Rokshas for quarries, in Cairo and its vicinity, at the end of the year 1902 was 613, of which 126 were given for life and 487 for a term of ten years.

During the year 1903 the Service cancelled 73 Rokhsas, 7 of the former and 66 of the latter class, while 43 new ones were granted. The total number in hand at the end of 1903 will thus be:—

The fees received for the new Rokhsas amounted to L.E. 1195,590 Milliems.

The different localities of all the licensed quarries under the control of this Service, and the time of expiry of their Rokhsas are shown in the annexed table.

### CENTRAL STORES

### I.—ARTICLES PURCHASED OR MADE.

(A) .	Instruments	and	camp	equipments.
-------	-------------	-----	------	-------------

(A) Instruments	and comply	edarhmei	160.	
Purchased from Europe England . France		L.E. м. 427 939 120 432	ыны м. 548 371	
Made by Govert-Services   War Office Arsenal		277 659 53 817		
Purchased in Egypt   from Gover	rt.Service:	66 539 123 901	331 476	
			190 440	1070 287
(B)	Furniture.			Milli Zai
Guizeh Wa	ter Service	21 117		
Made by Govert. Services   War Office		3 905		
Arsenal .		82 195	107 217	
Purchased in Egypt   from Government	rt.Services mrket	108 700 139 020		
			247 720	0+4 041
II.—REPAIR	e ma Lucron	TWENTS		354 937
Repairs made at the Arsenal				916 209
indicate the chrester				319 603 6.1744 827
III.—ARTICLES ISS				2.17++ 021
To the Irrigation Danston	SEED AGAINS	ol Paimi		
To the Irrigation Department Building and Tanzim			163 160 93 694	
" Nile Steamer Service			14 410	
Building and Tanzim Nile Steamer Service Daira Sanieh	*** *** ***		7 320	
" Sanitary Department			8 400	
" Messrs, Dupuis and Crawley		***	14 484	
Merchants in Cairo	***	***	0.300	1000 O. 1. 1. 1.
IV O		G		302 044
IV.—Orders G				
For issue of articles to Governt	. Services	197 000 16 000		
			213 000	
For receipt of articles returned purchased	*** *** ***	110 000		
/ purchased	100 000	54 000	164 000	
Miles I and I are the second				
The value of the articles deliv				harged to
the Budget was L.E. 1563.229 di	stributed as	follows:	_	
Icrigation Department	104 441 449			6 634
Building and Tanzim	*** *** ***		=	6 364
Administrative Service	100 000 000			3 707 0 940
Reservoirs Service	200 FE + 143		11	6 766
Survey Department	100	111 111	8	8 818
	Total	6 +++ x e +	L.E.156	3 229

### ARSENAL AND BOATS.

The work executed in the Arsenal workshops, and the materials delivered from its stores during the year 1903 amounted in value to L.E. 21327 as against L.E. 28357 the year before.

Most of this amount or 89.4°/o of it was charged to the different branches of this Ministry, the rest or 10.6°/o was charged to other Government Departments and private individuals, shown as follows:—

	1903	1902
	L.F.	L.E.
Value of work executed for P.W.D	17021	22504
Cost of coals and engine room stores for steamers	2031	2748
Total for P.W.D	L.E. 19052	25252
Value of work and meterials for other Govern-		
ment Departments Value of work and materials for private indivi-	2028	2966
duals	247	139
Grand Total	21327	28357
	=======================================	

The distribution of the above amounts is shown as follows:-

# SUM CHARGED TO THE DIFFERENT BRANCHES OF THE MINISTRY OF PUBLIC WORES.

MINISTRY OF PUBLIC WORES.		
	1903	1902
	L.E.	L.E.
Irrigation Services	11188	15328
Reservoir Service		146
Building and Tanzim Department	638	671
Survey Department	1252	1646
Administrative Service	51 )	370
Technical Service	346 (	910
Repairs to steamers and maintenance of Arsonal		
plant	3546	4343
m · 1	ER & Carrie	A LASTAGE
Total L.	E. 17021	22304
Sum charged to other Government Departments	:	
Sum charged to other Government Departments	1903	1902
Sum charged to other Government Departments		L.E
Ministry of Justice	1903 L.E. 10	L.E 325
Ministry of Justice	1903 L.E. 10 49	325 245
Ministry of Justice	1903 L.E. 10 49 325	325 245 211
Ministry of Justice	1903 L.E. 10 49 325 169	325 245 211 111
Ministry of Justice	1903 L.E. 10 49 325 169 45	325 245 211 111
Ministry of Justice	1903 L.E. 10 49 325 169 45	325 245 211 111 55
Ministry of Justice	1903 L.E. 10 49 325 169 45 11 360	325 245 211 111 - 55 928
Ministry of Justice	1903 L.E. 10 49 325 169 45 11 360 208	325 245 211 111 - 55 928 405
Ministry of Justice	1903 L.E. 10 49 325 169 45 11 360 208 3	245 245 211 111 - 55 928 405 107
Ministry of Justice	1903 L.E. 10 49 325 169 45 11 360 208	325 245 211 111 55 928 405 107 560
Ministry of Justice  Finance  Interior  Public Instruction  War  Army of Occupation  Sanitary Department  Mudirichs, Governorates and Town Councils  Khedivial Yachts  Model Workshops  Wakf Administration	1903 L.E. 10 49 325 169 45 11 360 208 3	245 245 211 111 - 55 928 405 107

The charge against the Irrigation Circles was much less this year than the year before. It amounted, as shown before, to L.E. 11188 in 1903 as against L.E. 15328 in 1902 or less by about 27%.

The main items in this charge were for :-

459 tons of steel pipes costing L.E. 5840 as against 671 tons at L.E. 8232 the year before.

119 tons of cast iron grooves costing L.E. 1259 as against 163 tons at L.E. 1766.

1780 pieces of regulating timbers at L.E. 1104 as against 3680 pieces at L.E. 2720.

Also L.E. 1211 for galvanised iron pipes imported for 2nd Circle, L.E. 299 for building new hull for steam launch "Yemkin" belonging to 1st Circle and repairing a lock gate for Ismailia canal, L.E. 121 for making grid irons and some castings for Etsa pumps, and L.E. 1354 for miscellaneous work and stores.

The quantity of work executed for the Building and Tanzim Department is practically the same as last year. This work consisted of:—

Castings for Ghiseh and	Ghe	sireh	þm	nps			***	0 0 0	LE. 180
Tree guards and grids	4.4.			***	* * *	0 to 0		+ 11 0	213
Repairing carts Making new carts	***	100		4.4.4	340			***	90 30
" wooden railings.	etc.					144	101		45
Miscellaneous work				***	***			***	811
				T	otal	n 4 4	2.00	0.0 a	L.E. 638

The Survey Department was supplied with angle iron triangulation marks for L.E. 766, and technical apparatus, office furniture and fittings, and sundry other work for L.E. 486.

The Administrative Service was charged L.E. 51 mainly for office furniture; and the Technical Service L.E. 346 for instruments and instrument repairs for the Central Stores.

The main items in the charge against the other Government Departments were for:—

Repairing steamers of the Ministry of the Interior	308
Making examination tables for the Ministry of Public Instruction  Making dust bins and carts for the Sanitary Department	151 335
Erecting machinery and doing other work for Model	118
Workshops Various other work and stores to the different Departments	777 3 <b>3</b> 9
Total L	E.2028

Very little was done to the Arsenal workshops this year.

The shop engines and some of the machine tools were repaired, the hand tools replenished, the portable engine and cranes in the yard overhauled and adjusted and some of the walls restored.

Of the floating plant, some of the rowing boats, barges and lighters, a house boat, and a landing stage were also repaired. The total cost of this amounted to L.E. 633 which was paid from the Arsenal profits.

Also, some spare articles and tools which cost L.E. 398 and paid for from the Budget were made in the shops and kept for the Arsenal in store.

The cost of materials bought for the workshops and steamers, exclusive of coals, amounted to L.E. 9802.

Of this amount, materials to the value of L.E. 7754 were taken from local merchants or imported from Europe through local agents, and L.E. 2048 ordered direct from Europe by the Service.

The total quantity of coals bought during the year amounted to 39050 kantars and cost L.E. 2838. Of this quantity, 26055 kantars costing L.E. 1520 were delivered direct to the Arsenal stores and 12995 kantars costing L.E. 1318 were taken from Cook's and the Daira Sania's and other coaling stations for the use of steamers when in commission.

The total amount spent on materials and coals during the year was thus L.E. 12640.

The quantity of stores issued to the workshops and steamers amounted in value to L.E. 13739, shown as follows:—

		Les Ex
Value of	materials used in workshops	11818
22 20	deck stores for steamers	778
99 99		430
0.5	engine room stores for steamers,	212
45 54	coals for steamers	501
	Total value of quantity issued	L.E.13739
Adding	value of coals taken from coaling stations	1318
	Total value of materials, etc	L.E.15057

The total cost of labour, which is nearly all native, amounted to L.E. 4538.

From the preceding statements it will be seen that most of the work executed in the Arsenal was for the Irrigation Circles and it mainly

consisted of the usual type of work such as sleepers, grooves, pipes, etc. The variation in the cost of the sleepers is very little; it depends on the price of wood which has been constant for the last two or three years. The quality of the work of preparing them does not call for any remark being every-day work well understood by the men.

The average cost of grooves has also remained unchanged. It is L.E. 9 per ton of ordinary grooves, and L.E. 10 per ton of grooves

with cast strips requiring planing by machine.

Since the introduction of the hydraulic rivetting machines in the Arsenal the rate of cost of iron work has gradually been reduced. In speaking on this subject in my last report I said "the Arsenal has, in my opinion, reached the limit of economy of labour on this kind of work and any further reduction of the cost must be looked for from the prices of materials." This year steel plates were bought at the average price of L.E. 7.90 per ton and coals at L.E. 1.30 per ton as against L.E. 8 and L.E. 1.35 per ton respectively in 1902, and rate of cost of steel pipes came to L.E. 12.25 per ton as against L.E. 12.27 per ton, which is practically the same.

Also, the rate of labour per ton came to L.E.1.38 as against L.E.1.49. This slight reduction in the rate of labour is owing to a small hydraulic rivetter made at the Arsenal and used this year in rivetting small pipes down to 0<sup>m</sup>75 diameter.

This small tool has not only afforded great facility in making the small pipes which were formerly made by hand under some difficulties, but also stopped the complaints we used to receive of this class of work.

In concluding my remarks on the workshops I should note the satisfactory state of the carpenters and joiners shop which is always kept busy and turns out excellent work.

Before high Nile every steamer was, as usual, thoroughly overhauled and repaired or furnished as required.

The total expenditure on the steamers during the year came to L.E. 6505.

Of this sum L.E. 2033 was spent on repairs, and deck fittings and stores, L.E. 2031 on coals and engine room stores, and L.E. 2441 on the crews. This is shown in detail in the following statement:—

STEAMERS.	Repairs.	Deck fittings and Stores.	Conls, Oils, stc.	Crew.	Total.		
	ton. M.	LE M.	T.E. M.	L.E. M.	L.E. M.		
Nasratieh Messir Tahta	271 275 45 497 136 466		242 906 234 372 117 875	375 313 144 100 319 753			
Kahira Bulak Refik Dendera	96 624 0 070 96 998 74 386	46 142	168 629 330 173 208 963 399 496	170 912 219 000 198 397 264 492	488 150 554 737 550 500 766 648		
Rekib Tawaf No. 1 Moeris No. 74 No. 25 Dredger No. 206	91 717 137 590 545 571 30 938 20 850 0 400 55 237	17 399 3 955	54 048 11 355	185 763 208 297 96 912 63 772 54 675 88 645 51 000	416 019 455 380 642 483 166 157 90 835 170 573 133 549		
Total	1,608 619	420 820	2030 811	2441 031	6505 290		

Of this total expenditure the sum of L.E. 5794 was paid from the Budget, L.E. 37 from the Arsenal profits, and L.E. 674 was received for coals and engine room stores consumed by steamers when lent.

On examining the boats after their return at the end of the flood season the Nasratieh was found to be unfit for any further service. Her engines and boiler were found to be in a very serious condition and incapable of repair. She is now laid up until money is available to buy her a set of engines and boilers.

Her hull and her aft saloon fittings are in a very good state having been thoroughly repaired and done up only three years ago, and in my opinion, if she is fitted with light modern compound engines and the roof of her forward saloon and cabins, which is rather low, is raised she will be one of the best steamers in the Service.

The Tawaf was also found to require replating almost throughout and some of her frames renewing. She was therefore taken in hand at once and is now nearly finished.

The aft cabin on the stern has been removed and the deck made flush as was done on the Refik and Rekib, and instead of the deck being single it has been made double, not only to render the cabins much cooler by allowing a current of air to pass between the decks, but also to allow any of the deck boards to be replaced without destroying the ceiling of the cabins.

Her boiler which was rather small for her engines has been replaced by a new one of a larger size which was ordered from Europe for Tug No. 1. This boiler will be able to supply the engines with sufficient steam and the speed of the boat will probably be increased one or two kilometres per hour.

The cost of all this work with the price of the boiler was estimated at L.E. 700.

Tug No. 1 was laid up in 1902, on account of the dangerous state her 40 years old boiler was found to be in, and a new boiler was ordered for her from England. On the arrival of this boiler, however, it was decided to put it in the Tawaf and put in No. 1 a suitable new boiler that was found at the Barrage.

Owing to the want of sufficient steamers for inspection during flood it was decided to convert No. 1 into an inspection boat, and I hope in a short time she will be finished. The estimate for this work was about L.E. 250 (boiler not included).

We have now in course of construction a new tug boat to replace No. 1. This boat, which is built after the lines of the Barrage tug No. 30, will be propelled by an old engine taken some years ago out of the s.s. Jaffa and kept in the Arsenal stores, and the boiler lately taken out of the Tawaf will be utilised to supply this engine with steam. The total expenditure on this boat is estimated at L.E. 450.

In closing this section of my report I should like to add that Mr. Curtis has performed his duties in an efficient and satisfactory manner, and the work turned out under his supervision, speaks, as in previous years, very highly of him and also of the staff and men under his charge.

M. ANIS, Chief of Technical Department.

Cairo, 14th April, 1904.

### QUARRIES SERVICE.

### YEARS OF EXPIRY OF ROKHSAS.

LUCALITY.	<u>Bina</u>	1905	110(113)	[507]	11000	Tisons	1910	1911	1912	1913	1929	Rokhena for Hfe.	fistal.
L—Stone and balat quarries.  Helwan Ma sara (et) Tura Hashmy (et) Messan (et) Eyoun Manasa Harat (et) Leore (et) Tablaa (et) Tablaa (et) Rasatin (et) Lewata Abiat (et) Ma dassa (et) Lewata Ahmar (et) Abbassich (et) Khushub (et) Unalani (et) Raha (et)	9 3 7 4 3 1 4 1 1 4 1 2 1 1 4 1 1 2 1 1 1 1 1 1 1	11 81 - 1 7 1 8 8   22 1	3 3 1 1 18 1 18 1 18	4 6 2     10       10         10	10 1 1 5 8 9 1 1 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	3 5 7 2 3 5 10 10 10 10 10 10 10 10 10 10 10 10 10	1	641   62   7424   1	3111   144   1   152   29   31   1   1   1	5 10 2 3 4 3 2 1 1		11 69   4 0 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6	18 46 44 6 22 5 43 4 8 5 5 40 18 6 20
Rab-el Naer		1 2	-	=	=	_ _ _	- 8	1 6	<u>-</u>	110	111		1 45
III.—Gathering of gypsum,  Fr. Helman to Knywl Boy. 22a  IV.—Extraction of clay.  Mu'ssam (cl)		-	1	1	-	-		-		-	-	-	2
Total	. 34	37	52	59	61	48	1.1	46	25	kin	3	139	583



# RAPPORT DU SERVICE DES ANTIQUITÉS

POUR L'EXERCICE 1903

PAR

G. MASPERO



## RAPPORT DU SERVICE DES ANTIQUITÉS

### Pour l'Année 1903.

### 1. - SERVICE ADMINISTRATIF.

L'augmentation totale de notre budget régulier a été, pour l'exercice 1903, de L. E. 784: elle a porté pour L. E. 184 sur le personnel classé, et pour L. E. 600 sur le personnel non classé. Elle nous a permis d'améliorer le sort de quelques-uns de nos petits employés et de perfectionner la marche des affaires sur plusieurs points; toutefois nous ne sommes pas encore organisés aussi complètement qu'il serait nécessaire et nous serons obligés de demander à l'État quelques légers sacrifices de plus, afin d'assurer partout le fonctionnement exact du Service.

Inspection du Directeur général. - Elle a été retardée par suite d'un accident survenu au remorqueur nº 1, que le Ministère met d'ordinaire à una disposition. J'ai dû louer à la Compagnie Cook un de ses remorqueurs, et bien qu'elle cut consenti gracieusement à baisser ses tarifs, il m'a fallu changer mon programme : je suis remonté à la vapeur jusqu'à Assouan, sans m'arrêter nulle part, puis, renvoyant le remorqueur, je suis redescendu vers le Caire à la rame et à la voile, si bien que l'inspection de cette année n'a pas coûté plus cher que celles des années précédentes. Elle a duré deux mois, du 3 janvier au 8 mars, et, malgré les lenteurs de la navigation, elle a donné des résultats satisfaisants. Entre Phila et Edfou, j'ai pu visiter les carrières d'El-Khannakah, les ruines voisines du village d'El-Hagar, et le petit temple romain de Resrîs, que j'ai retrouvés tels que je les avais connus autrefois. Par contre, les restes de la ville byzantine et arabe de Bouéib ont été fort endommagés lers de la construction du chemin de fer d'Assouan: la partie basse de la ville a été démolie par les ouvriers, y compris une moitié de la basilique, et, seule, la ville laute demeure à peu près intacte avec son donjon et ses remparts. La grotte des Crocodiles, près de Maubdell, a été saccagée sans pitié après 1886 : les momies ont été mises en pièces, et des incendies, allumés par l'imprudence des chercheurs de papyrus, ont détruit le contenu de galeries entières. La plupart des autres localités situées entre Siout et Miniéh, Cosséir el-Amarna, Hadji-Kandîl, Bercheh, Cheikh-Abadéh, ont moins souffert; toutefois, les ruines de la ville romaine située au Kom el-Ahmar, près de Zaouiét el-Amouat, ont reçu dans ces derniers temps la visite des marchands de Mellaoui. L'inspecteur du Service, Sobhi Effendi Arif, prévenu en temps utile, a saisi quelques masques en plâtre d'un beau style et d'une conservation excellente, mais d'autres objets ont échappé à ses recherches et sont encore sur le marché occulte des antiquités.

L'état des grands édifices ne s'est pas modifié sensiblement depuis l'an dernier. J'ai eu pourtant le regret de constater, lors de mon passage à Thèbes, que deux des colonnes encore debout dans la région septentrionale de la Salle Hypostyle menaçaient de s'écrouler, ainsi que les architraves brisées qu'elles soutenaient : ordre a été donné aussitôt à M. Legrain de tout préparer pour les démonter et pour en refaire les fondations pendant l'hiver de 1903-1904. J'ai reconnu également que le petit temple de Déir el-Médinéh exigeait une restauration sérieuse : il faudra déposer la porte de l'enceinte, dont les fondations ont cédé, et probablement reprendre l'une après l'autre toutes les colonnes de la cour et du pronaos. Le temple de Gournah, lui aussi, semble être parvenu à terme de résistance, et bien des touristes ne s'aventureraient pas dans les salles s'ils soupgonnaient la condition précaire de plusieurs des colonnes et des murs, M. Barsanti, que j'ai chargé de l'examiner à fond, a conclu comme moi à la nécessité d'y opérer des travaux considérables dans le plus bref délai. Le manque d'argent nous a arrêtés au cours de cette année, mais, aussitôt que la consolidation de l'enceinte d'Edfou sera terminée, M. Barsanti ira commencer celle du temple de Gournah. Je crains que ce ne puisse pas être avant 1905 au plus tôt.

Travaux des inspecteurs en chef. — J'ai montré déjà combien il était nécessaire aux inspecteurs en chef d'avoir auprès d'eux quelques employés chargés de leur comptabilité et de leur correspondance tant avec l'administration centrale qu'avec leurs inspecteurs locaux et avec les agents des autres administrations égyptiennes. M. Quibell, qui réside au Caire, a pu utiliser le personnel du Musée pour les affaires de son inspectorat, mais M. Carter n'a pas la même ressource, et, cette année, j'ai dû continuer de lui adjoindre à titre provisoire deux secrétaires, dont l'un, Tewfick Effendi Boulos, est payé à raison de L. E. 60 par an sur les fonds de touristes, tandis que l'autre, Chehatah Ayoub, touche un salaire de L. E. 36 sur le chapitre des indemnités. Notre budget ne nous permet pas de faire davantage, mais le moment approche où il faudra doter l'Inspectorat du Said d'un personnel plus nombreux et mieux rétribué: prenant en considération le nombre toujours croissant des affaires, j'estime que ce ne serait pas trop de deux bons employés à

demeure, un secrétaire-interprète, qui suivrait l'inspecteur dans ses tournées, et un comptable, tous les deux inscrits dans le cadre.

1º Inspectorat du Sud. — Jusqu'à présent, l'Inspecteur du Sud avait résidé sur la rive gauche du Nil, dans la maison bâtie par le Service il y a une douzaine d'années lors du déblaiement de Médinet-Habou: l'éloignement du site et son isolement m'ont décidé à transporter le siège de l'administration sur l'autre rive du Nil. Un emplacement nous a été concédé par le Ministère des Finances, à petite distance au nord de Louxor, entre la route de Karnak et le fleuve, assez vaste pour contenir la maison de l'Inspecteur, les bureaux de l'Inspectorat et un magasin d'antiquités. La construction a été commencée en octobre dernier, sur des plans dressés par M. Baraize et approuvés par la Direction des Bâtiments civils: par décision du Comité d'archéologie, la dépense sera imputée sur le fond des touristes et répartie entre plusieurs années. D'octobre à fin décembre M. Baraize a construit les bureaux et l'écurie, le tout représentant une somme d'environ L. E. 450; les travaux de la maison d'habitation ne commenceront qu'au mois d'avril 1904, lorsque nous saurons à peu près quel a été le rendement des cartes de touristes.

La lumière électrique a fonctionné pendant tout l'hiver dans la Vallée des Rois, sans accident ni à-coups : nous n'avons pas été obligés de recourir une seule fois aux lanternes préparées dans chaque tombeau, en vue d'une extinction subite des lampes. La machine a été démontée au printemps, puis revue pièce à pièce, et elle n'a été remise en marche que dans les premiers jours d'octobre, lors du retour des touristes. L'expérience de cette année nous a révélé, comme de juste, quelques légers défauts de l'installation; nous avons reconnu, par exemple, qu'il y avait avantage à conserver toujours sous la main une provision d'eau plus forte, et nous avons ajouté deux réservoirs nouveaux aux deux que nous avions jugés suffisants d'abord. Il nous a fallu aussi modifier un peu la composition de notre personnel d'électriciens et engager de ce chef une dépense un peu plus forte; mais, d'autre part, les frais de production et d'entretien sont montés beaucoup moins haut que nous ne l'avions pensé, ce qui nous a permis d'opérer cette modification sans dépasser, et même sans atteindre, nos prévisions. Le résultat a donc été heureux en tout sens, et il m'a encouragé à user du même mode d'éclairage dans d'autres localités. En attendant que nous l'appliquions au Sérapéum et aux tombeaux de Sakkarah, j'ai ouvert des pourparlers avec la maison Cook pour l'installation d'un réseau à Ibsamboul, et j'ai tout lieu de croire que l'année 1904 ne s'écoulera pas sans que le spéos de Ramsès II soit éclairé à l'électricité.

Le parc à baudets construit dans la Vallée des Rois ayant été d'une véritable utilité pour les âniers et pour leurs bêtes, il m'a paru bon d'en établir de pareils dans tous les endroits qui sont visités par les touristes en bandes. Nous en avons installé déjà plusieurs dans les localités de la rive gauche, à Déir el-Bahari, au Ramesséum, à Médinet-Habou : la maçonnerie en est achevée, et ils seront couvert dans le courant de l'an prochain. Nous en ferons autant à Karnak, des que le déblaiement sera avancé suffisamment.

La surveillance des monuments a été aussi pénible que les années précédentes : l'attaque dirigée en 1901 sur le tombeau d'Aménôthés II est demeurée impunie, ainsi que le vol d'une quantité de pièces d'or découvertes à Karnak. Les procès intentés ou soutenus par le Service contre les particuliers qui usurpent les terres antiques appartenant à l'État sont de même restés stationnaires : le plus important de tous, celui que nous avons avec Khalafallah bey au sujet de terrains à sébakh de Haou, est toujours pendant devant le tribunal de Kéneh, bien que les expertises aient jusqu'à présent tourné à notre avantage. Enfin, dans certains cas, à Erment, par exemple, où les tribunaux avaient décidé en notre faveur, nous n'avons pas encore obtenu l'exécution du

jugement.

Les travaux de réfection et de fouilles entrepris par M. Carter ont marché régulièrement. A Thèbes, le déblaiement du Ramesséum a continué avec le concours de M. Baraize ; une partie des édifices et des voutes en briques qui entourent le temple a été déblayée, et les décombres ont été amoncelés régulièrement le long du fossé d'enceinte pour protéger l'aire mise au jour. A Médinet-Habou, la prise du sébakh a été dirigée de manière à dégager le mur antique, dont nous comptons utiliser les restes afin de clore le téménos du temple. En décembre 1903, une porte en grès y a été découverte par les fellals, sur laquelle les scènes et les inscriptions n'étaient ni sculptées, ni peintes, mais constituées par des combinaisons d'émaux incrustés dans la pierre : une partie des pièces d'émail a été détournée par les preneurs de sébukh, mais nous avons pur en racheter la plus grande partie, et j'espère rétablir le monument presque en entier au Musée du Caire. D'autre part, les fouilles commencées par M. Carter en 1902, à la Vallée des Rois, ont amené, pendant les derniers jours de janvier 1903, la découverte du tombeau de Thoutmôsis IV. Le mobilier funéraire avait été mis en pièces par les voleurs antiques, et les débris en gisaient épars sur le sol, mais les peintures des chambres et le sarcophage sont intacts. Les débris, recueillis et classes par MM. Carter et Newberry, sont aujourd'hui au Musée, à l'exception d'un petit nombre de pièces dont le

Service a fait hommage à M. Davis. Le tombeau de Thoutmôsis IV vidé, M. Carter a transporté les ouvriers dans un endroit voisin, où certaines indications nous engageaient à chercher le tombeau de la fameuse reine Hatshepsouitou. Les fouilles, menées cette fois encore aux frais de M. Davis, sont plus pénibles que nous ne nous y attendicus. Le couloir, d'une pente très raide, a été vidé sur une longueur d'environ 180 mètres, sans que nons soyons encore parvenus à la chambre funéraire, et la chaleur y est si suffocante que nous devons envoyer sans relâche de l'air frais aux ouvriers au moyen de la pompe achetée naguère par M. de Morgan : nons étions descendus sons le temple de Déir el-Bahari dans les derniers jours de décembre, sans que nul indice nous montrât que nous approchions de la fin, mais la dureté et la composition des remblais prouvent qu'ils n'ont pas été remaniés depuis une époque fort ancienne. Il est évident que l'architecte pharmonique a voulu placer la chambre funéraire derrière la stèle qui décore le fond de la chapelle du sacrifice, dans la partie méridionale du temple de Déir el-Bahari, et c'est derrière cette chapelle, ou à peu-près, que nous nous attendons à trouver le sarcophage de la reine au cours de l'année 1904. En inspectant le même quartier de la Vallée, il m'a paru reconnaître deux points où se cachent des tombes encore inconnues, peut-être celles de Thoutmôsis II et de Hrihoron: M. Carter y transportera ses chantiers, sitôt que la fouille actuelle sera terminée.

2º Inspectorat du Nord. — Comme d'ordinaire, M. Quibell a eu plus d'affaires contentieuses à régler que de travaux scientifiques à exécuter. L'exploitation à outrance des tells du Delta par les preneurs de sébakh amène chaque année la découverte de menus objets, de monnaies, de statues, que nos gardiens saisissent rarement, mais dont la saisie, lorsqu'elle peut avoir lieu, entraîne presque toujours un procès; de plus, les parties de tells épuisées sont usurpées par les propriétaires voisins, à mesure qu'elles descendent à peu près au niveau du terrain environnant. M. Quibell a défendu de son mieux les droits du Service, qui sont ceux de l'État Égyptien, et cette tâche ingrate a consumé le meilleur de son temps. Il a continué la consolidation du temple d'Abydos, et il a achevé la fouille commencée par M. Dove Covington dans le champ des Pyramides de Gizéh : il sera question plus loin de cette dernière affaire.

Inspecteurs indigènes, réis et ghafirs. — J'avais demandé que les salaires des inspecteurs indigènes fussent relevés; le Ministère des Finances a bien voulu me donner satisfaction partielle sur ce point. Grâce à la transformation d'un poste d'inspecteur de troisième classe en

un poste d'inspecteur de première, nous avons pu récompenser l'un de nos meilleurs officiers, Aly Effendi Habib, du zèle et de l'activité qu'il déploie depuis vingt-cinq ans pour la cause des Antiquités. L'inspecteur d'Assouan et d'Edfou, Mahmond Effendi Mohammed, a été promu à la seconde classe, et nous avons accordé au nouvel inspecteur de Gournah, Moursi Effendi Halim, un traitement d'entrée plus élevé que celui qui est alloué d'ordinaire aux inspecteurs nouveaux. Dans le Delta, la mort de M. Botti nous a obligés à réunir provisoirement le petit inspectorat d'Alexandrie à l'inspectorat de Gharbiéh. Dans l'Égypte Moyenne, Mohammed Effendi Chabân et Sobhi Effendi Arif ont permuté, le premier passant au Fayoum, le second à Miniéh-Assiout. L'exploration systématique du Fayoum par les savants européens, venant après l'exploitation dévastatrice des fouilleurs illicites, y a épuisé la plupart des anciens sites, et la vente ou la mise en valeur des terrains du Gouvernement a diminué considérablement les espaces à surveiller : le Fayoum convenait donc à un inspecteur fatigué, tel que Mohammed Effendi Chaban. Au contraire, les deux moudiriehs de Siout et de Miniéli ont vu se multiplier depuis quelques années les champs de fouilles, et quelques-unes de leurs villes, Mellaoui, Siout, Gaou, sont devenues des centres importants de recel et de trafic clandestin. Le transfert de Sobhi Effendi dans cette région menacée a produit aussitôt des effets heureux: il ne faut pas nous dissimuler pourtant que la lutte sera longue, et que des années probablement s'écouleront avant que nous ayons eu raison de ces marchands, auxquels les lois actuelles assurent presque l'impunité.

La situation et le nombre des nos ghafirs et de nos réis ne changent pas sensiblement. J'ai pu porter à L. E. I par mois tous ceux d'entre eux qui ne touchaient pas cette somme, mais l'ensemble des salaires demeure insuffisant, si l'on considère le travail ardu que nous exigeons de ces gens et les responsabilités qu'ils encourent. Le tableau suivant en montrera le nombre et lu répartition sur le territoire égyptien, ainsi que la quotité de leur solde et les fonds sur lesquels elle est imputée:

Inspacyonars.	Nombre.	For ch. 1 art. 2 g Personnel Hors endre.	or ch. I art. 1 Fouilles.	Fonds des Tonristus.
Inspectoral du Nord:  Ménoufiéh-Galionbiéh (Inskiéh-Dahkuliéh Ghurbiéh-Béhéra Fayoum-Béni-Souef Miniéh-Siont Girgéh	2 10 -5 21 32 13	12 96 36 195 108 36	1.41. 1.2 1.2 2.4 7.2 3.6 2.4	12 - 258 105
Inspectorat du Sud :  Dendérah	12 16 34 25	24 12 12 108	12 144	110 400 186 272 400 180
Relevant du Musée directement : Gizéh	7 7 345	36 43 200 223 800	=	72 66 349 200
Total	220	942	336	1611

Les provinces de Miniéh et de Siout ont bénéficié de la meilleure partie de l'augmentation : elles ont reçu neuf ghafirs nouveaux et je prévois qu'elles en exigeront d'autres. Il nous faudra instituer une cinquantaine de postes environ pour compléter la surveillance de l'Égypte entière. J'ai dû ajourner cette création, faute d'argent; en revanche, j'ai nomme dans chaque circonscription un chef-ghafir, dont les appointements sont un peu plus élevés que ceux des ghafirs ordinaires. Depuis que, sous l'impulsion des inspecteurs en chef, les inspecteurs locaux ont manifesté une activité toujours plus grande dans l'exercice de leurs fonctions, j'ai reconnu qu'ils devaient avoir toujours sous la main un homme de confiance, qu'ils pussent mander d'urgence dans les localités où ils étaient empêchés de se rendre eux-mêmes, ou qui les accompagnût dans leurs rondes et leur prêtât main forte au besoin, lorsqu'ils seraient obligés d'arrêter quelque fouilleur illicite. J'ai donc placé d'abord des chefsghafirs dans deux inspectorats, celui du Fayoum et celui de Siout, pendant le cours des deux années dernières; les résultats obtenus m'ont engagé à généraliser l'institution, et, depuis 1903, tous les inspecteurs ont un chef-ghafir attaché à leur personne.

Loi sur les Antiquités. — Le projet de loi qui avait été établi d'accord commun entre le Service, le Comité d'Archéologie et Mr. de Roccaserra, a été de la part du Comité de Législation l'objet d'une révision minutiense, à la suite de laquelle une troisième rédaction en a été donnée par les soins de M. Brunyaite. Toutefois, avant de le présenter à l'approbation de S.A. le Khédive et du Corps Législatif, le Comité de Législation insista pour qu'il fut soumis aux puissances, en vue d'une application immédiate aux étrangers qui résident en Égypte, bien que, dans l'origine, il du toucher les seuls indigènes. Une tentative dans cette direction, faite officiensement aux mois d'août et de septembre, aboutit, comme on devait s'y attendre, à une fin de non-recevoir; et les choses en sont au point même où elles en étaient avant la démarche. Nous attendons que les autorités compétentes se soient décidées soit à promulguer le dernier projet sous une forme plus ou moins modifiée, en l'appliquant aux seuls indigenes, comme je le proposais, soit à en remettre la promulgation à des temps meilleurs, et à laisser le Service se débattre péniblement contre les voleurs et contre les destructeurs des monuments.

### 11. - LES FOUILLES ET LA RÉFECTION DES MONUMENTS

Comme d'habitude, je me bornerai à indiquer sommairement les localités explorées par les savants étrangers et les résultats principaux qu'ils y ont obtenus. Un accident mortel a jeté un voile de tristesse sur la fin de leur campagne. Le lundi 6 avril, M. Gombert, pensionnaire de l'Institut français d'Archéologie, qui dirigeait les fouilles de Tounah, voulut explorer la colline à laquelle la stèle de Khouniatonou est adossée. L'enquête menée par notre inspecteur de Miniéh, Sobhi effendi Arif, prouva qu'il s'était aventuré, seul et sans aide, sur l'un des sentiers qui courent en corniche le long de l'escarpement qui domine la plaine en cet endroit. Soudain, entre 11 heures et midi, ses ouvriers le virent perdre pied et tomber d'une hauteur de 15 ou 16 mètres; la roche avait cédé sous son poids, et il s'était fracassé les deux jambes sur un seuil pierreux qui émergeait à demi du sable. Le gardien du Service courut à Mellaoui chercher du secours, mais six heures s'écoulèrent avant que le blessé pût recevoir la visite du médecin attaché au Markaz, Mohamed Effendi Anouar. Il fut transporté à Mellaoni après les premiers soins, et là il fut panse aussi complétement que son état le comportait par le Dr. Askren. de la Mission Américaine, que les autorités locales avaient mandé surle-champ. Le Directeur de l'Institut, M. Chassinat, prévenu par une dépêche, se rendit sur les lieux avec M. Lacau, et tous deux, avec le concours dévoué du D' Askren, l'emmenèrent au Caire dans la nuit du 7 au 8. Reçu à l'hôpital français, il y mourut le dimanche 12 avril, jour de Pâques, à 4 heures et demie de l'après-midi. La perte de sang au moment de la chûte avait été si grande et l'ébranlement nerveux si violent que la sensibilité en avait été considérablement réduite: à part quelques intervalles de crise aigué pendant lesquels les douleurs furent intolérables, il souffrit médiocrement, et il ne soupçonna jamais l'état désespéré dans lequel il s'était trouvé des l'instant qu'on le releva. M. Gombert était un élève de l'École Centrale des Arts et Métiers de Paris et un architecte d'avenir, qu'un goût très vif pour l'archéologie avait amené en Egypte. Il avait travaillé aux fouilles françaises d'Abou-Roache, de Baouit et de Tounals. Sa troisième année de séjour finissait et il allait rentrer en France, lorsque la mort l'a frappé traitreusement. Tous les savants présents en Égypte, Allemands, Anglais, Italiens, ont voulu s'associer, comme le Service des Antiquités, au deuil de l'Institut français, et présenter l'expression de leur commisération au père qui arrivait trop tard pour voir une dernière fois son fils vivant.

L'Institut français avait ouvert successivement trois chantiers. Celui de Toumh était en pleine activité lorsque la mort de M. Gombert le désorganisa: le récit de la fouille sera publié par les soins de M. Chassinat. A Baouit, MM. Chassinat et Palanque avaient continué pendant deux mois les travaux îmaugurés par M. Clédat, l'année précédente, parmi les ruines d'un monastère copte. Ils les interrompirent de nonveau pendant les derniers jours de février, et ils s'établirent dans la nécropole de Siout où, à la suite d'un accord intervenu avec un colonel en retraite de l'armée égyptienne, M. Chassinat avait obtenu l'indication de plusieurs sites vierges. Ils y étudièrent plusieurs tombeaux intacts des X° et XI dynasties, dont M. Palanque a dressé minutiensement l'inventaire. Le Service a gagné pour sa part deux statues en bois d'un style fruste, mais de belle conservation, et toute une série de cercueils et d'objets funéraires qui complètent ses séries. Il a eu la désagréable surprise de se trouver impliqué, ainsi que M. Chassinat, dans un procès que plusieurs des commanditaires du colonel avaient intenté à celui-ci au moment du partage; mais ce n'était là qu'une chicane, et il a été mis promptement

hors de cause par le tribunal mixte du Caire.

L'antique Antinoé a fourni à M. Gayet son contingent habituel de cadavres desséchés de basse époque romaine, et d'objets de toilette, de culte ou de ménage, parmi lesquels il a cru reconnaître un outillage de sorcière. M. Jonguet et son collaborateur Gustave Lefebvre, envoyés par le Ministre de l'Instruction Publique de France et par l'École française d'Athènes, après avoir achevé l'exploration de Médinet en-Nahas et de Médinet Mahdi au Fayoum, ont poussé une pointe sur la grotte des Crocodiles à Maabdéh, puis, d'après mon conseil, ils se sont arrêtés à Tehnéh, où personne n'avait travaillé sérieusement. Ils n'ont pas abordé la butte où se cachent les restes superposés de la ville ancienne; ils ont opéré dans les nécropoles gréco-romaines, et ils en ont retiré des monuments fort originaux, entre autres des cercueils et des momies en miniature à masque d'épervier et à décor en cire colorée. Plus de cent cinquante stèles funéraires en grec et en copte ont été retenues par le Service, et sont allées enrichir le Musée d'Alexandrie.

Les missionnaires allemands ont poursuivi leurs explorations sur leurs sites accoutumés. M. Borchardt a persévéré autour des pyramides d'Abousir, et M. Rubensohn, après avoir hésité quelque temps, s'est fixé sur les tells d'Achmounéin, non sans succès, partie aux frais de la Société Orientale, partie pour le compte de diverses Universités. Entre temps, le gouvernement allemand a sollicité par voie diplomatique le prêt, vers Médinet-Habou, d'un terrain où bâtir une maison à l'usage des savants qui désireraient étudier les hypogées thébains: c'est une conception pareille à celle que le gouvernement français avait que des 1883, lorsqu'il construisit sa maison à Louxor, entre le temple et l'hôtel Pagnon, Le terrain a été délimité en janvier 1903, d'accord commun entre M. Borchardt, M. Carter et moi, puis il a été remis aux représentants de l'Allemagne, sous condition pour ceux-ci de l'employer toujours dans un but purement scientifique, et de n'y installer ni hôtel, ni établissement commercial ou industriel: il ne pourra être ni loué, ni transféré, ni aliéné d'aucune manière, et, le jour où l'Allemagne renoncerait à l'occuper, il reviendrait de droit au gouvernement égyptien avec les constructions, les plantations et tous les aménagements qui y auraient été faits.

Vers le même temps, la difficulté de défendre les cimetières de Guizéh contre les entreprises des bédouins a décidé le Comité d'archéologie à en concéder l'exploitation aux particuliers qui se présenteraient. M. Covington avait travaillé déjà en 1902 au Sud du Sphinx, et il avait mis au jour un mastaba d'époque archaïque. Cette découverte, dont les personnes peu au courant des travaux de Mariette, s'étaient exagéré l'importance, avait soulevé une émotion assez vive, qui se traduisit, en janvier 1902, par des protestations contre l'attribution du site à d'autres qu'à des professionnels de l'égyptologie: d'accord avec le Contentieux du Ministère des Travaux Publics, j'ai maintenu les droits de M. Covington jusqu'au jour où, l'argent lui manquant, il y renonça de lui-même. Je pris alors la suite des travaux, et je déléguai M. Quibell à les achever. Ils ne don-

nèrent, comme nous avions lieu de le penser d'après l'expérience de Mariette en 1859, 1860 et 1861, que des résultats à peu près nuls: depuis lors, la concession de M. Covington est demeurée virtuellement vacante. Le reste du terrain qui avoisine les pyramides a été divisé en trois lots entre MM. Steindorff, Reissner et Schiaparelli, avec cette réserve toutefois que, vu l'importance des lieux, si d'autres requérants se présentaient, une part leur serait attribuée dans les endroits où les premiers occupants n'auraient pas encore établi leurs chantiers. M. Reissner s'est borné à prendre possession de son domaine qu'il compte explorer à fond et de manière exclusivement scientifique; MM. Steindorff et Schiaparelli ont procédé à l'exploitation du leur, et ils y ont déblavé quelques mastabas assez bien conservés de la IV dynastie.

M. Steindorff agissait pour le bénéfice de l'Université de Leipzig, mais M. Schiaparelli avait une mission officielle du gouvernement italien. L'Italie s'est décidée en effet à suivre l'exemple que lui donnaient l'Allemagne, l'Angleterre et la France, et elle s'est associée à l'exploration archéologique de l'Égypte. M. Schiaparelli a demandé et obtenu, ontre le champ de Guizéh, quatre localités importantes: la Vallée des Reines à Thèbes, le Gebel-Tarif dans toute sa longueur, les ruines d'Achmounéin, et l'emplacement de l'antique Héliopolis. Il n'a pas touché cette année au Gebel-Tarif et il a effleuré à peine Héliopolis. Il a découvert et vidé complètement, avec l'assistance de M. Ballerini, plusieurs tombeaux dans la Vallée des Reines: le plus intéressant à tous les points de vue est celui d'un certain prince Khamoisit, fils de Ramsès III. M. Breccia a travaillé quelques semaines à Achmounéin, et il y a recueilli des fragments de papyrus assez nombreux: toutefois des difficultés, survenues entre lui et M. Rubensohn au sujet de leurs concessions respectives, ne lui out pas permis de donner à ses opérations toute l'étendue qu'elles comportaient.

M. Reissner n'n pas encore ouvert d'ateliers à Gébéléin; de même que les années précédentes, il a concentré ses efforts sur les cimetières archaïques de Thinis, à Naga ed-Déir. Il y a appliqué, en collaboration avec M. Lythgoe, la même rigueur de méthode dont il avait donné l'exemple dans ses campagnes antérieures, et il en a été récompensé par le même succès.

M. Garstang s'est risqué sur les pentes inférieures de Béni-Hassan, que j'avais jusqu'alors recommandées en vain à l'attention des égyptologues, et il y a ouvert, outre deux hypogées de l'âge Memphite, beaucoup de tombeaux encore intacts du premier Empire Thébain, ceux des princes secondaires du nome de la Gazelle ou des officiers attachés à la personne des grands seigneurs enterrés à l'étage supérieur: sa campagne a été

presque aussi fructueuse, pour lui et pour notre musée, que celle de M. Chassinat, à Siout.

M. Flinders Petrie, qui agit cette fois encore pour le compte de l'Egypt Exploration Fund et de l'Egypt Research Account, a dégagé les restes du sanctuaire d'Osiris, à Abydos, et il est descendu dans le sous-sol jusqu'anx ruînes des édifices de l'époque thinite; il a de plus retrouvé, derrière le temple de Séti 1<sup>et</sup>, le Mennonium souterrain de Ménephtab, dont les sculptures promettent une riche moisson de représentations et de textes curieux. M. N. de G. Davies a continué de copier quelques-uns des tombeaux d'El-Amarua dans l'intérêt de l'Archaeological Survey. MM. Newberry et Tytus ont relevé une partie nouvelle du palais d'Aménôthés III, au sud-ouest de Médinet-Habou. M. Mond a vidé et nettoyé entièrement cinq des tombes de Cheikh Abd-el-Gournah. Enfin MM. Grenfell et Hunt ont recueilli à Bahnésa, dans les décombres de l'antique Oxyrrhynchus, une riche collection de papyrus, dont plusieurs leur ont rendu des fragments inédits d'auteurs classiques.

En exécution de la décision prise en 1902 par le Comité d'archéologie, aucune concession nouvelle n'a été accordée aux amateurs qui avaient demandé l'autorisation de fouiller. Le Service, lui non plus, n'a pas entrepris de fouilles proprement dites, mais, en exécutant le déblaiement de la pyramide d'Ounas, à Sakkarah, M. Barsanti a rencontré un grand puits d'époque saîte, celui d'un amiral Hikoumsaouf, dont la momie a enrichi le Musée de beaux bijoux en or et en pierres dures. M. Carter a, comme je l'ai dit plus haut, ouvert l'hypogée de Thoutmôsis IV, puis il a attaqué l'hypogée de la reine Hatshepsonitou, le tout aux frais de M. Théodore Davis. M. Baraize a relevé et mis au net trois autres feuilles du plan de la nécropole thébaine.

Mais, si nous avons dû restreindre encore nos fouilles personnelles, nous avons imprimé un développement considérable à nos travaux de réfection et de consolidation des monuments existants. J'avais chargé, l'an dernier, M. Barsanti de préparer les édifices de Philæ à recevoir le choc de l'eau: l'épreuve de cet hiver justifie la confiance que j'avais mise en lui, comme aussi elle a tourné à l'honneur de MM. Ball et Taylor, à qui le Ministère des Travaux publics avait confié le soin de raffermir le sous-sol de l'île et les fondations des monuments. Les dégâts subis par les reprises et les sontènements récents ont été absolument insignifiants, et les quelques retouches que nous avons été amenés à y faire n'ont pas atteint la somme de 10 L.E. D'autre part, les monuments sont sortis sains et saufs du bain prolongé qu'ils avaient subi. Il est vrai que le mur du temple de Rome et d'Auguste s'est écroulé, mais sa chûte ne pouvait être évitée: tous les autres temples sont intacts. Nous avons donc

toute raison d'être satisfaits et d'espérer pour le mieux; néanmoins, il sera prudent d'attendre cinq ou six années encore, avant de porter un jugement sur le sort qui attend Philæ. Les sels ont foisonné en effet aux points de rencontre de l'air et de l'eau sur la surface de la pierre, et la bande humide qui cerne la base de toutes les murailles m'inspire des craintes. Des lavages minutieux nous ont débarrassés des efflorescences, mais nous sommes désarmés coutre l'humidité permanente et contre les actions diverses qu'elle pourra produire à l'intérieur des blocs de grès.

J'avais signalé l'an dernier l'état précaire dans lequel se trouvait une portion du mur occidental du temple d'Horns à Edfou, et l'argence qu'il y avait de le reconstruire. M. Barsanti s'est rendu sur les lieux à la fin de mars 1903, en compagnie de M. Carlo Oropesa et du réis Khalil, et il a procédé, sur une longueur de 85 mètres, à la démolition du mur menacé. A mesure que les blocs descendaient, il les emmagasimait régulièrement à l'ouest du temple. La dépose achevée, il a consolidé les fondations en les garnissant sur leurs deux faces d'un banc de béton qui en a triplé la largeur. Il n'a quitté les lieux que dans les premiers jours de juillet, malgré la chaleur torride qui n'avait presque pas cessé de sévir depuis le début des opérations, et il a réouvert ses chantiers dans la première quinzaine de novembre. A la fin de décembre 1903, dix assises étaient remontées déjà à leur place primitive. M. Barsanti a ordre de s'arrêter lorsqu'il aura atteint la quatorzième ou la quinzième assise, et de laisser les portions reconstruites tasser jusqu'à la fin de l'inondation prochaine: l'œuvre sera terminée en décembre 1904 ou en janvier 1905 au plus tard. Les dépenses, imputées sur noure fond des touristes, et, par autorisation spéciale de la Caisse de la Dette, sur le fonds de Phila, out été:

De mars à fin juin	Restaurations	173 12 813	475   sur fonds 761   de 743   Philee.
En juin et juillet	Restaurations	1.E. 285 35	M.
De nov. à fin déc	Restaurations		305   Sur fonds de 305   Phiko

soit en tout L.E. 1596,809 dont L.E. 1276,016 sur le fonds de Philæ et et L.E. 320,795 prises sur notre fonds des touristes.

A Karnak, M. Legrain a rebâti, jusqu'à la hauteur de six mètres environ, dix des onze colonnes renversées en 1899. Il a, de plus, tout préparé pour le démontage de deux autres colonnes, dont j'avais constaté le mauvais état au mois de janvier, pendant mon inspection: il a dressé autour d'elles les pylônes de terre usuels, et il a profité de l'occasion pour déblayer les portions du mur septentrional de la salle qui faisaient face à la ville antique. Il a de même poussé activement l'aménagement de la cour située au sud-est de la Salle Hypostyle. Il y a recueilli la plupart des blocs qui manquaient encore à la porte d'Aménôthès 1er dont j'avais signalé l'existence parmi les remblais, dans mon rapport de l'an dernier: nous la reconstruirons peut-être en 1904, et nous enrichirons Karnak d'un monument dont le souvenir était perdu depuis trentequatre siècles. Au cours de ces opérations, et pendant la dernière quinzaine de décembre, M. Legrain a cu la bonne fortune de mettre la main sur une véritable mine d'objets antiques. Il semble que, vers l'époque persane ou du temps des Ptolémées, une sorte de gouffre boueux s'était creusé, à peu près dans le milieu de la cour; on en fit une javissa pour les monuments hors d'usage qui encombraient le temple, et on le combla avec tout ce qu'on avait de monuments et de débris dans le voisinage. M. Legrain a retiré déjà de cette poche onze statues variant d'âge entre la XII<sup>e</sup> et la XXX<sup>e</sup> dynasties, la plupart intactes, quelquesunes fort belles qui, toutes, sont allées enrichir le Musée du Caire: elle nous réserve à coup sûr d'autres surprises,

M. Legrain avait reçu en outre la mission de nettoyer la région qui s'étend entre le sanctuaire de granit et la Salle Hypostyle, au nord de l'allée centrale. Il a déplacé l'énorme fragment d'obélisque en granit qui écrasait le mur de Thoutmôsis 1<sup>et</sup>, dégagé l'allée centrale, relevé, dans la mesure du possible, les parties détruites des pylônes et les colosses Osirieus de Thoutmôsis 1<sup>et</sup>. Il a découvert à cette occasion la salle du couronnement de Thoutmôsis III, des bas-reliefs représentant le retour triomphal d'Aménôthès II après sa campagne victorieuse en Syrie, un beau groupe bien conservé de Thoutmôsis IV et de la reine Tiâ. Ç'a été, en somme, la campagne la plus fructueuse qu'on ait faite à Karnak, depuis les grandes campagnes de Mariette, et la dépense totale en a été seulement, du 1<sup>et</sup> janvier au 31 décembre:

D								L.E.	M.
Remantage des colonnes		2 0 0				 	***	721	985
The Harrist Ha								1703%	157/3
I STEPHINGL								43143.4	297
Achat et transport de mate	riel	100	= 1 =	004	0.00	 		351	748
								20(1)	

Il convient d'ajouter, pour compléter ce tableau, l'indication de quelques travaux exécutés au moment du sébakh, dans plusieurs localités de la Haute et de la Basse-Égypte. De même, des portes out été mises à divers tombeaux qu'il importait de protéger contre les déprédations des fellahs, nous avons acheté quelques objets en province, et nous avons accordé des gratifications modestes à plusieurs personnes qui nous avaient signalé des monuments intéressants. Tout compris, l'ensemble de nos dépenses, abstraction faite des sommes consacrées à Edfon et à Karnak sur allocation spéciale, a été, pendant l'année 1903, sur les deux chapitres Fouilles et Compte Touristes, ce qui suit:

	Las Ka	31.
Sakharah	124	012
Mit-Rahipéh	17	690
Guizeh	8	(381)
Kiman-Paris	11	040
Zaoniet-el-Amouat	7	
Aelmounéia	12	365
Tounal	11	600
Balansourah	3	240
Bibau-el-Moulouk	64	320
Assonn	()	320
Koubbet-el-Haoua	46	700
Transport de matériel et d'antiquités et réparations	113	712
Ciratifications pour objets signales	23	665
Admits	108	380
PR1 0 8 Y21	1141	724
Total L.E	1141	124

La plupart des objets que nous avons achetés provenaient de fouilles illieites, et ils avaient été saisis par nos inspecteurs après dénonciation. Bien que nous eûssions pour presque tous la preuve suffisante du détournement, j'ai préféré donner quelque argent aux coupables, afin d'éviter des procès que, dans l'état actuel de la législation, nous aurions perdus très probablement, malgré notre droit. Un seul sarcophage en pierre d'époque Ramesside, volé à Tounah, et dont la cuve avait été mise en pièces par les inventeurs, nous a coûté de la sorte environ L.E. 230. Il est regrettable que l'État soit forcé de dépenser de parcilles sommes pour récupérer son bien légitime.

## III. - LE MUSÉE ET LES PUBLICATIONS DU SERVICE

Dans mon rapport de 1902, j'avais exprimé la crainte que nons n'enssions dépassé de quelques centaines de livres la somme de L.E. 8500 qui nous avait été allonée pour notre déménagement. Les comptes n'étaient pas aporés complètement, au moment où j'écrivais, et nous ignorions encore l'étendue de nos engagements vis-à-vis de l'Adminis-

tration des Chemins de fer de l'État, J'ni eu, depuis lors, la satisfaction de constater que les chiffres prévus par moi n'avaient pas été atteints, et que notre dette était moindre que je ne l'avais supposé. Nos opérations, loin de nous laisser en déficit de quelques centaines de livres, se soldent par un bénéfice d'environ L.E. 80. C'est un fait que je suis heurenx d'enregistrer.

A mesure que nous connaissons mieux notre logis neuf, les défants qu'il présente deviennent évidents et nous essayons de les corriger. L'un des plus saillants et sur lequel j'ai attiré, des le début, l'attention des architectes, était la surabondance de lumière et l'excès de chaleur qui en résultait. Dès le lendemain de l'installation, j'avais fermé toutes les ouvertures pratiquées dans la muraille extérieure du premier étage et les claustra qui bordent la partie haute de la galerie centrale: des châssis en bois léger, garnis de gros papier bitumé et revêtus sur leurs deux faces d'un fort calicot sur lequel on passa par la suite une couche de badigeon blanc, nous permirent d'arriver à nos fins pour un peu moins de L.E. 20. Les galeries latérales du premier étage y gagnèrent, mais le mieux ne se fit pas sentir dans les atriums à deux étages: le jour continua d'y tomber en larges nappes de clarté brutale et crue, blessant les yeux des visiteurs ou des employés du Service, et dénaturant l'aspect des monuments. Pendant le printemps et l'été de 1902, la température se maintiret si élevée que certaines de nos peintures grecques à la cire fondirent à moitié; la couleur de plusieurs cercueils s'écailla, les montures en fer de plusieurs des vitrines qui abritaient les momies royales se faussèrent, et les glaces qu'elles encadraient se félèrent par la dilutation du métal. Des rideaux de toiles de Vichy teinte en bleue furent placés aux fenêtres du rez-de-chaussée, et, tamisant le jour, ils y rendirent la chaleur supportable; mais il fallait user de moyens plus radicaux pour le premier étage, et le Ministère voulut bien, sur mes instances réitérées, remplacer les vitrages en toit à double peute qui recouvraient nos atriums par les lanternaux cubiques, à fond plein, à éclairage latéral, semblables à ceux de l'ancien musée de Boulak. Cette modification, commencée en mai par la Direction des Bâtiments civils, a été achevée dans les premiers jours de décembre, et les conséquences en sont tout à l'avantage de nos collections: la lumière pénètre en quantité suffisante dans les salles du rez-de-chaussée et n'est plus dangereuse dans celles du premier étage. Nous devrons toutefois compléter l'effet de cette transformation par un système de rideaux ou de volets dont nous ferons l'essai pendant l'été de 1904.

Le Musée nous avait été livré presque nu. Au rez-de-chaussée, une bande de peinture rouge, à l'huile, couvrait les soubassements jusqu'au tiers de la hauteur, mais, partout nilleurs, les murs avaient été simplement passés au blanc. Après avoir étudié la question près d'une année, je me décidai à tenter, sous un propre responsabilité, un essai de décoration du rez-de-chaussée. Le style général de l'édifice et le soubassement rouge qu'on lui avait donné nous imposaient le parti pompéien: il me parut qu'il fallait relever la bande préexistante aux deux tiers de la hauteur, de manière à former un fond sur lequel les statues s'enlèveraient tout entières en vigueur. Je choisis, pour le tiers supérieur, un ton crème à la détrempe, et pour les chapiteaux des piliers un modèle à fond rouge qui rappellerait les soubassements et qui ferait la transition entre la tonalité violente du bas et les tonalités douces des plafonds. J'attribuai à ceux-ci une numee d'un bleu très lèger, qui atténuât encore la lumière et dont le reflet enveloppât les monuments d'une atmosphère plus calme et plus fine que celle dans luquelle ils se trouvaient présentement. L'ensemble, exécuté dans la Salle M sur mes indications par le peintre du Service, M. Carlo Oropesa, en août et septembre, retouché puis simplifié par moi au début de novembre, plût au Comité d'archéologie et à la Direction des Bâtiments civils; je demandai un Ministère de vouloir bien s'en remettre à nous du soin de décorer le rez-de-chaussée. On pensa, comme moi, que nos peintres, dressés au respect de l'antiquité et surveillés directement par M. Oropesa, risqueraient moins de tacher les monuments que les ouvriers des entrepreneurs ordinaires; nous étions d'ailleurs assez bien outillés pour accomplir notre tâche de façon très économique. Le Ministère voulut bien mettre à ma disposition une somme de L.E. 512 qui suffira largement. M. Oropesa s'est attelé à la besogne en décembre 1903 et il aura tont achevé en mars 1904; nous nous occuperons ensuite de chercher des motifs et des tons qui conviennent aux salles du premier étage.

D'autres améliorations sont à l'étude et pourront être opérées en 1904. Grâce à l'intervention amicale de Sir Eldon Gorst, le Ministère des Finances nous avait cédé, outre les marbres du grand escalier de Guizéh, tous les marbres, toutes les vitreries et toutes les ferrures de ce palais que je jugerais utiles à l'installation du Musée nouveau. J'ai pu recueillir aiusi un nombre de balustres, de mains-courantes et de plaques assez considérable pour qu'il soit possible de substituer un dallage en marbre aux ciments de la galerie d'honneur, et de remplacer les balustrades et et les rampes en maçonnerie pleine qui déparent le premier étage de cette même galerie, et les escaliers par des balustrades et des rampes de marbre à jour. Ces changements s'opéreront par les soins de la Direction des Bâtiments civils, au printemps de 1904, après le départ des touristes; sur ma demande, on profitera de la circonstance pour supprimer les

malencontreuses ouvertures ovales qui éclairent l'antichambre des deux escaliers principaux et pour mettre à leur place un plafond en verre.

L'exèdre bâti autour du surcophage de Mariette a été achevé en novembre 1903, et la statue en bronze qui doit l'orner a été expédiée de Paris par le sculpteur Puech, dans la dernière quinzaine de décembre: elle sera mise en place par M. Barsanti, et nous espérons que l'inauguration pourra en avoir lieu en mars 1904.

Les bâtiments du secrétariat nous ont été livrés au mois de septembre et les bureaux y ont été installés aussitôt par les soins de M. Bazil. Les pièces qu'ils avaient occupées à l'intérieur du Musée ont été aménagées aussitôt, l'une en cabinet pour le Directeur Général, qui n'avait point su place dans le Musée et qui avait reçu un asile provisoire à la Bibliothèque, l'autre en salle de réunion pour le Comité d'archéologie qui siégeait naguère au Ministère des Travaux publics. Les aménagements nécessaires ont été faits avec les huisseries et les verreries que le Ministère des Finances nous avait autorisés à prendre au palais de Guizeh.

Le classement des collections a progressé sans relâche. Au rez-dechaussée, nous avons réussi à trouver un emplacement définitif en bonne lumière, pour la plupart des monuments sur lesquels il convenait d'attirer l'attention du public. et, comme conséquence de cet arrangement modifié, nous avons rectifié la numérotation de l'ensemble. Nous avons substitué aux numéros noirs, sans suite, qui étaient propres au Musée de Guizéh, des numéros rouges qui se continuent de salle en salle; j'ai luissé dans la série des lacunes qui permettront d'y insérer les monuments nouveaux à leur rang, sans qu'il soit besoin de la bouleverser tous les deux ou trois ans. A mesure que l'œuvre avançait, j'ai remanié les parties du Guide imprimé l'an dernier, qui correspondaient aux salles du bas, et j'en ai corrigé les erreurs ou complété les notices: M. Quibell a traduit le texte ainsi revu en anglais, avec la collaboration de Mac Quibell et de Miss Pirie, et cette traduction a été mise en vente dans les derniers jours de décembre. Une traduction arabe, due à la plume d'Ahmed bey Kamal, est sous presse et paraîtra dans le courant de l'année 1904. Tant que l'édition française de 1902 ne sera pas épuisée, les monuments du rezde-chaussée qui y sont décrits garderont l'ancienne numérotation noire à côté de la numérotation rouge: les vieux numéros ne seront enlevés que le jour où nous serons en mesure de réimprimer le texte français. En attendant, et pour faciliter la recherche aux visiteurs, j'ai affiché dans chaque salle un plan, sur lequel les monuments décrits figurent seuls et sont indiqués par une teinte rose. J'ai de plus, posé sur chacun de ces monuments une grande étiquette à la main, où l'on lit, au-dessous du numéro rouge, une notice sommaire en anglais, en arabe et en fran-

cais. Par malheur, les poissons d'argent en ont rongé déjà une partie: j'étudie les moyens de remplacer les étiquettes écrites à l'encre de Chine par des étiquettes imprimées dont l'encre grasse résistera mieux aux insectes destructeurs Le temps m'a manqué de remanier les salles du premier étage. Nous y avons pourtant fini de garnir le pourtour de la galerie d'honneur avec des armoires vitrées et des momies appartenant à la série des grands-prêtres d'Amon. Nous avons installé les objets provenant du tombeau de Thoutmôsis IV dans la salle qui renfermait déjà les objets découverts chez Thoutmôsis III et chez Aménôthès II. Nous avons vidé presque entièrement la salle d'anthropologie, dont le contenu est passé dans les collections de l'École de Médecine, et nous n'en avons retenu que les pièces nécessaires à l'histoire de l'embaumement. En revanche, nous avons organisé une salle nouvelle pour la Faune et pour la Flore monifiée de l'antique Egypte. M. Lortet, doyen de la Faculté de Médecine de l'Université de Lyon, nous avait prié, en 1899, d'instituer des fouilles aux frais de son Université en vue de rassembler des momies d'animaux: pourvu que nous lui permissions de conserver les doubles, il s'engageait à nous renvoyer au Caire la série complète des squelettes et des cadavres montés et préparés, et à les installer dans nos vitrines par les soins d'un des naturalistes de son Muséum, sans qu'il nous en coutât rien. Le Comité d'Archéologie avait accepté la proposition, et l'arrangement était entré en vigueur au profit de tous les intéressés, mais j'avais toujours remis l'inauguration de la collection au moment où le musée serait établi dans les bâtiments nouveaux. Au mois de décembre dernier, M. Guillard, aide-naturaliste au Muséum de Lyon, est arrivé avec ses cuisses et il a procédé, avec le concours de M. Daressy, à l'accomplissement des promesses de M. Lortet, Il m'a paru utile d'exposer partout, à côté des squelettes ou des cadavres déshabillés, les momies des animaux de chaque espèce recueillies dans les hypogées; j'y ai même adjoint les bois que nous possédons et l'herbier que M. le professeur Schweinfurth a bien voulu préparer pour nous depuis 1882, avec les fleurs trouvées sur les momies royales à Déir el-Bahari. C'est, on le voit, un musée unique au monde que nous avons constitué, sans autres frais pour le Service que la confection de quelques vitrines. Nous l'avons établi vis-à-vis de la salle des bijoux, dans la galerie qui surmonte la portion sud-ouest de la façade principale. L'an prochain, quand nous aurons transporté les bijoux dans le local que je leur ai destiné à l'autre extrémité des galeries, je mettrai à leur place nos admirables collections de silex taillés.

Nos publications se sont développées de la façon la plus encourageante. Les *Annales du Service* ont terminé leur quatrième volume, et je me suis

efforcé d'y multiplier les planches. J'ai déjà dit que l'édition anglaise du Guide avait para et que l'édition arabe s'imprimait. Notre grand Catalogue s'est enrichi de sept volumes, celui de Daressy sur les Textes et Dessins magiques, celui d'Edgar sur les tireck Moulds, celui de Grenfell et Hunt sur les Greek Papyri in the Cairo Museum, celui de Bissing sur Die Fayenzengefässe, eelui de Strzygowski sur Die Koptische Kunst; enfin le quatrième volume de Lange-Schiffer sur les Grab-and Denksteine des Mittleren Reichs a vu le jour ainsi que le premier de M. Lacau sur les Sarcophages antérieurs au Nouvel Empire. Neuf autres volumes sont sous presse, ceux de Chassinat sur la Seconde trouvaille de Déir el-Bahari, de Milne sur les Stèles Grecques et Romaines, de Spiegelberg sur une partie de nos Textes Démotiques, de Carter et Newberry sur le Tombeau de Thoutmôsis II', d'Edgar sur les Greek Bronzes, d'Almed bey Kamal sur les Stéles hiéroglyphiques d'époque ptolémaique et romaine, de Quibell sur les Archaic Objects, plus la troisième partie du catalogue de Lange-Schäfer et la seconde de celui de Lacau; la plupart d'entre cux paraîtront dans le courant de 1904. Nous avons enfin en préparation huit volumes, de Lacau sur les Stèles du nouvel empire, de Daressy sur les Statues et statuettes de divinités, de Maspero sur les Sarcophages en pierre des époques saite et gracque, d'Ahmed bey Kamel sur les Tables d'offrande, de Newberry sur les Scarabées et sur les Statuettes Funéraires, de Weigall sur les Poids, de Bissing sur les Vases en pierre, d'Edgar sur les Greca-Egyptian Glass. l'ajouterni que, profitant de la présence de M. Gaillard, je l'ai chargé de rédiger le Catalogue de la salle des animaux, et, qu'usant de la faculté que le Comité m'a accordée d'engager pour quelques mois les savants de passage en Égypte, je me suis assuré le concours de MM. Dyroff, Moret et Bénédite pendant l'hiver de 1903-1904. Les frais de rédaction et d'impression sont, cette fois encore, couverts par les L.E. 2,000 que la Caisse de la Dette veut bien m'attribuer à cet effet chaque année, et par les économies que j'ai pu réaliser sur les fonds qu'elle m'avait accordés pour le même emploi pendant les années précédentes.

Je suis heureux d'annoncer que le second volume du Dahchour de M. de Morgan est enfin terminé, et que le second fascieule du tome deuxième de son Kom-Ombo est à l'impression, ainsi que le premier fascieule du tome deuxième du Musée Égyptien. Dès que l'achèvement de ces ouvrages aura rendu disponibles les fonds sur lesquels ils étaient imputés, je reprendrai la publication du Cutalogue général des monuments de l'Égypte avec le Karnak de Legrain et le Médinet-Habou de Daressy.

Notre bibliothèque a continué de s'enrichir : elle a acheté ou reçu en don, cette année, un millier de volumes et de brochures nouvelles. J'ai

dû m'adjoindre les services d'un employé spécial, M. Duerot, pour la mettre en ordre, la classer et en rédiger le catalogue. Les opérations préliminaires de cette entreprise ont pris fin en décembre. La confection des fiches commence, et j'espère que nous ne reverrons plus reparaître le désordre qui nous a fait perdre naguère quelques-uns de nos volumes les plus précieux.

Exposition l'niverselle de Saint-Louis. — Cette année, le gouvernement égyptien, renouant une tradition interrompue depuis un quart de siècle, décida de participer à l'Exposition Universelle qui s'ouvrira à Saint-Louis d'Amérique, en avril 1904, et le Service des Antiquités fut prié de collaborer à l'organisation de la section égyptienne. L'invitation me fut transmise au mois de mai 1903; en même temps avis me fut notifié que le Ministère des Finances plaçait L.E. 2,500 à ma disposition, et qu'en plus, une indemnité journalière de L.E. 2 serait allouée au délégué que nous enverrions installer et surveiller nos collections. Il m'a fallu improviser cette exposition en six mois; on me pardonnera, je l'espère, si elle n'est pas aussi complète que je l'aurais faite, prévenu plus tôt. Je me suis décidé à y introduire deux éléments différents; des reconstitutions exactes des scènes de la vie antique; des séries de pièces originales, choisies de manière à donner une idée suffisante des monuments qui nous font connaître la civilisation égyptienne.

Ce plan sommaire approuvé par le Ministère des Travaux publics, je commandais à M. Hébert, sculpteur attaché au Musée d'Ethnographie de Paris, et à qui j'ai eu à faire plusieurs fois pour des restitutions de ce genre, notamment lors de l'exposition de 1889, dix mannequius en plâtre, de grandeur naturelle, représentant dix Égyptiens de l'époque Ramesside, six femmes et quatre hommes, dans des attitudes diverses.

lls devaient être groupés de manière à former trois scènes :

1º Une dame égyptienne à sa toilette ; elle achève de se farder les yeux, et une servante agenouillée lui présente un vêtement.

2" Un fonctionnaire de haute classe, dinant. Il est assis devant un guéridon chargé de mets ; un serviteur l'évente et tient la goulléh pleine d'eau, tandis qu'une musicienne et une danseuse exécutent sous ses yeux un intermède de danse et de chant.

3° La fabrication du pain et de la bière. Ces deux opérations ont été réunies, la première étant indispensable à l'autre, et la bière se fabriquant avec une levure de mie de pain. Le tout occupe quatre personnages : deux femmes, dont l'une écrase le grain et dont l'autre cuit les miches ; deux hommes, dont l'un brasse la pâte et dont l'autre poisse les jarres qui doivent contenir la bière, afin d'empêcher qu'elle ne se gâte en vieillissant.

Le corps de ces dix mannequins fut moulé sur le vif, dans les poses que j'avais choisies. Les têtes furent modelées d'après des têtes de statues égyptiennes, celle de la soi-disant Taia, celles de la mère de Thoutmôsis IV et de Thoutmôsis IV lui-même, celle du scribe Joupai, du Louvre, L'ensemble fut peint par M. Hébert et par ses aides, et les perruques furent agencées, sur des modèles que j'avais indiqués, par le perruquier du Théâtre Français.

Ces opérations remplirent une dizaine de semaines, de juillet à fin septembre, mais les caisses n'arrivèrent au Caire que dans les derniers jours de novembre : comme les mannequins avaient souffert pendant la traversée de la Méditerranée ils furent restaurés très adroitement par le sculpteur et par le peintre du Musée, MM. Fanghænel et Oropesa. Cependant, l'un de nos menuisiers, M. Andrea Altobello, avait préparé, d'après des originaux que j'avais trouvés au Musée, tous les accessoires de chaque scène, lit, chaises, pliants, tables, coffres à linge et à bijoux, objets de toilette, instruments de musique. Brugsch bey avait découvert des étoffes indigènes, de fabrication et de dessin pareils à ceux des étoffes anciennes : une couturière ajusta les costumes sur les patrons que j'avais taillés. L'habillage terminé, chaque scène fut réglée par moi et photographiée par Brugsch bey, pour que notre représentant pût la remettre en place à Saint-Louis dans l'ordre qui m'avait paru le plus propre à en faire valoir le détail.

Le peu de temps qu'on m'avait accordé ne m'aurait pas permis d'opérer de fouilles spéciales en vue de me procurer tous les objets dont nous avions besoin. J'ai pu tirer de Sakkarah un mastaba complet de la IV dynastie, mais il m'a fallu emprunter une partie des autres monuments aux réserves du Musée et acheter le reste aux marchands d'antiquités. Néaumoins, je pense que l'ensemble intéressera les visiteurs de l'Exposition. Je me suis efforcé de leur montrer une série funéraire aussi riche que possible, et, à cette intention, j'ai expédié, outre le mastaba, un beau sarcophage carré, en granit rose, de la IV dynastie, sans inscription, deux cercueils carrés de la XII<sup>e</sup> dynastie, déconverts à Siout cette année même, trois cercueils anthropoïdes avec momies de l'âge Ramesside et de l'époque grecque. Le mobilier comprend quelques chevets en pierre ou en bois, quelques bateaux, quelques coffrets à statuettes, un choix de répondants des types les plus variés, des amulettes, des colliers, des perles en émail multicolore on en pierres dures. Un bon choix de statuettes en bronze et en terre émaillée donnera quelque idée de la religion égyptienne, mais la peinture et la sculpture ne seront représentées par aucun objet de valeur, en dehors des bas-reliefs de notre mastala : nous n'avons pu envoyer que des moulages dont le plus important, celui de nôtre Khéphrên, a été peint par M. Oropesa et reproduit très exactement

l'aspect de l'original.

Sur le refus de M. Brugsch bey, M. Quibell a bien voulu se charger d'aller installer notre section et de la surveiller pendant les premiers temps au moins. Pour lui faciliter la mise en place, j'ai fait fabriquer au Musée toutes les boiseries des armoires nécessaires : il n'aura plus qu'à en assembler les pièces et à les garnir de verres loués à Saint-Louis même, et, en quelques jours, tous les petits objets de notre envoi pourront être exposés. Le remontage du mastaba sera un peu plus long, mais le numérotage des caisses qui le contiennent est tel, qu'aucune erreur n'est possible dans l'appareillage des blocs. M. Quibell a de plus une liste des prix dressée par Brugsch bey avec les indications nécessaires pour les majorer de toute la quantité qu'il estimera utile à couvrir les frais de transport, d'aménagement et de gardiennage. L'emballage sera terminé vers le 25 janvier, et, à partir de cette date, le convoi entier et M. Quibell lui-même seront à la disposition de M. le Commissaire Général.

Les dix mannequins nus ont coûté chacun 500 francs: rendus au Caire, habillés, pourvus de leur mobilier et de leurs accessoires, l'ensemble des trois scènes nous est revenu à L.E. 300 environ. Le mastaba, emballé et prêt à partir, représente un peu plus de L.E. 200. Il nous a falla dépenser environ L.E. 700 pour nous procurer le reste de la collection par fouille ou par achat. D'autre part, j'avais prélevé L.E. 1000 pour les frais de voyage et d'installation à Saint-Louis : L.E. 300 ont été remises à M. Quibell, et L.E. 700 à M. Lawford. Afin de me couvrir contre toutes les erreurs de prévision possibles en pareille matière, j'ai mis à part L.E. 300 qui, au cas où nos calculs auraient été justes, pourront être employées, dans la suite, à compléter par de nouveaux envois d'Egypte, celles de nos séries que M. Quibell, étant sur les lieux, jugera convemble de renforcer. L'exposition close, tous les objets sans exception seront vendus, et, pour peu que l'opération soit conduite avec soin, je pense que le produit en sera assez considérable pour rembourser le Trésor Égyptien de ses avances, en partie sinon en totalité.

Je ne puis mieux terminer ce rapport qu'en y joignant l'état comparatif de nos recettes hors budget, pour les deux saisons 1901-1902 et 1902-

1903:

NATURE DES RECETTES.				1901-1902		110/2-110/8		En plus peur 1982-1983.	
				1. ft.	М	L.E.	M	L.E.	36.
Touristes		4 4		3,796	SCH1	3,951	11101	154	600
Salle de vente				126	610	1,050	885	124	275
Entrée au Mi	isée			625	550	714 000 88 5			540
	Publications			242	670	574	072	331	402
Publications	Chakfs			378	582	543	841	165	259
	TOTAL		• •	5,069	412	6,833	988	864	076

On voit que l'augmentation est sensible sur toute la ligne : elle tient, pour le fonds des touristes et pour les chakfs, à l'activité de nos agents et à la surveillance plus efficace qu'ils exercent sur leurs districts. J'estime pourtant que la fraude sur les billets enlève encore un cinquième environ de la recette, et que nous touchous à peine la dixième partie de ce que les chakfs devraient nous rapporter : j'essaierai de remédier à cet état de choses, mais on sait combien la fraude est difficile à découvrir en pareille matière, et il s'écoulera des années avant qu'elle soit réprinée complètement.

G. MASPERO.

## REPORT ON AGRICULTURAL RAILWAY LINES

1903

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JAMES A. GUNN.



## REPORT ON AGRICULTURAL RAILWAY LINES.

Cairo, 26th March, 1904.

SIR WILLIAM GARSTIN, K.C.M.G., Under Secretary of State, Ministry of Public Works.

SIR,

General Remarks.- In reviewing the working of the Light Railways for 1903, I have the honour to state that there has been a very sound improvement in every way. The receipts have increased notwithstanding the fact that the year has been a rather unfavourable one, owing to a shorter cotton crop and other drawbacks, such as cattle plague and the fact that no Moulids were held, all of which considerably affreted the traffic. In addition to this, the lines had no unusual augmentation as was the case during the previous year for large irrigation works.

The kilometrage has not been materially increased, but a great deal of work has been done and large sums have been expended in lengthening sidings, reducing gradients, and more fully equipping the lines with engines and vehicles. A more highly paid staff has been found necessary in order to handle the traffic. The Companies do not give a uniform service, nor can it be expected of them, as some districts are so much more remunerative than others, but where the traffic warrants it, they give the public a very good service. Special goods trains are frequently needed to relieve the traffic, and the Companies should be encouraged whenever it is necessary to run these specials to ensure a more regular service.

There have been considerably over four and a half million (4,783,885) passengers carried during the past year, and only few complaints recorded, most of which were due to irregular train service. There is, however, a marked improvement in this direction, and I think all the Companies are beginning to realize that an irregular service is damaging to themselves; it is, however, largely minimized by the number of

specials they are running.

Tariffs.—The question of tariffs is now before the Light Railway Commission. The note which I have prepared on this subject has been laid before the Commission and is appended hereto. The chief points of which are :—

1st. The advisability of only fixing a maximum for all classes as laid down by the Concession.

2nd. After the classification has been accepted by the Government, there is no need to fix a minimum.

3rd. That undue competition should be avoided, adhering to rule B recommended by the Commission in September, 1902.

4th. That the Companies should be allowed to change their rates between the maxima of one class to the maxima of the next class below, without applying to the Government.

The lifting of unremunerative lines .- There have been one or two cases of this nature before the Commission: one in Favoum and one in Lower Egypt. The former Company was allowed to do away with the line, but in the latter case sanction was witheld. I would suggest that some fixed rules should be adhered to in deciding these matters. In the East Province the lines seem to have been laid without due consideration. The present owners naturally wish to be relieved of the onus of keeping up an unremmerative line; the section in Charkieh through which it runs from Bordein to Bordein junction is certainly well served by the Government lines and the land-owners adjoining the light railway line do not appear to use it at all. In the case of the Fayoum, very much the same circumstances exist, but they have not yet availed themselves of the permission to lift their line. I would recommend that if a Company can satisfy the Government that the lines are not being, or likely to be used by the land-owners adjoining after a fixed time for trial, say three years, that they should be allowed to lift their lines.

Level erossings.—Although it is generally admitted that level crossings are not desirable, yet it would be almost impossible to insist upon over and under bridges for every crossing; the country is small and closely intersected with agricultural and Decauville lines, the former of which must, of necessity, frequently cross the trunk lines. There are cases where only a few trains are run and these at very low speed, when it would seem that danger is reduced to a minimum, for instance on the line between Cherbine and Kalline where level crossings are applied for, there are only three trains a day with an interval of about six hours between each. The crossings could be made near the stations with a system of signals and interlocking devices, if necessary, and under the control of the Government Railways' Station Master. The opposition

shown by any Government officials to any trains crossing their lines might almost be considered a guarantee of safety in itself. At Benha where there is a margin of twenty minutes allowed for crossing, if the light railway train is even two minutes late, and they try to make a crossing, the signals are closed against them.

Working jointly with the Government line.—The working of the joint stations has, during the last year, been noticeably better in all Provinces. Goods have generally been promptly transhipped and few complaints have been made for delays by any of the railways, even during the heaviest season. All the Light Railway Stations have not yet been opened by the Government Railway for through-booking, which is asked for by the Companies. If this is allowed it would no doubt prove a benefit to all.

Location of the line.—This is important from an economical and working point of view. There are many instances of badly placed lines, and the Companies more fully realize the necessity of careful location, as they are taxed to the utmost in maintaining and repairing rolling stock on badly placed lines. The damage to stock and permanent way is heavy and incurs great expense. It is, besides, most wearing to the train staff and particularly to the engine drivers to have a line that follows too closely the sharp curves of the agricultural road. With the constantly increasing traffic many changes will be necessary in order to eliminate the curves: in some places new surveys will have to be made.

Figures giving the number of passengers carried, receipts, etc., are appended in Table No. 1.

Increase of goods.—The total number of tons lifted during the year amounted to 642,969, showing an increase of 48,483 tons over the previous year. Considerably less cotton was carried, but there was a large traffic in building materials, there being a substantial increase in this line during the last two years.

Telephones and Telegraphs.—There were 65 kilometres added to the Egyptian Delta Light Railway Company's lines. In general the work has been much better than last year. If properly organized and extended it might be a useful factor in working the interior of the Provinces and no doubt some arrangements could be made with the Companies, as has been done with the Delta.

Lighting of Trains and Stations.—As trains have to do a good deal of work after dark during the winter months, the lighting of trains and stations should be improved. Several cases of cotton stealing might have been prevented had the lighting been better.

New lines.—Twelve kilometres of lines were added in Lower Egypt for the Delta Company.

In future construction of lines.—No curves in the open country should be less than 100 metres.

Under no circumstances should the lines run directly through villages.

Stations sites should not be situated near public highways.

It would also be satisfactory if some arrangement could be made with the land-owners near stations to avoid crowding and hampering the Companies' works by erecting buildings too mear stations. The Government might prohibit the placing of buildings within a reasonable distance of the stations.

Increuse of passengers.—The total number of passengers carried by the Companies during the year amounted to 4,783,885, showing an increase on the previous year of 415,001.

The competition with Government lines.—A map is attached showing the Light Railway lines in Lower Egypt and proposed lines. Although it is undoubtedly the case that the Light Railways do compete with the Government lines to some extent, being so closely interlaced with the trunk lines; this is, however, more than made up for by the fact that the Light Railways carry large numbers of passengers and goods to the Government lines. In short they develop travel and traffic, and take it over short leads which would not be profitable to the State Railways.

A significant fact too is that wherever the Light Railways have penetrated, the price of land has gone up enormously not in a speculative sense, but cultivators can go in and find a market practically at their doors by means of these lines.

The boat service must be reckoned with as a very formidable competitor of the Railways, with their long distance transport from the sea South to Assouan and all river ports. The figures received from the Finance Department show that during the last 14 months 1,325 boats of all descriptions have been added to the service, making a total in all

of 22,212 with a total ardebage of 2,534,251, the largest proportion being sailing "Kayassas".

Egyptian Delta Light Railways Company.—The receipts of the Egyptian Delta Light Railways Company to the end of September, 1903, show an increase of L.E. 3,861 over the previous year.

This may be considered very good, as on account of the cattle plague the markets were closed and no Moulids were held, and there was no stone traffic at Zifta Barrage, which in 1902 amounted to L.E.14,426. The cotton crop also affected the receipts.

The Company's working expenses were increased 4% owing to increase of kilometrage and traffic, and a more highly paid staff being engaged.

Receipts and expenditures.—				
3 4			1902	1903
			L.B.	L.E.
Receipts	0.0	0.4	125,610	129,471
Working expenses			77,193	80,420
Nett receipts			48,417	49,051
Working expenses to gross receipts		4 4	61.469	
Receipts pe: kilom. per week			3.02	3.09
THE NAME OF THE PARTY OF THE PA		4.0	1.86	1.92
Passengers carried during 1903			=3,636,688	
n n 1902		a a	=3,311.448	
An increase of			325,240	
Goods traffic for 1903			471.529	tons traffic
1902		-		do. (Zifteh traffic
71 10 14 20112				included)
An increase of			7.601	tons
2807 1000 0000 00				

The Company's corrected measurement is now 813 kilometres. They have constructed in the past year 12 kilometres of line, viz: Samanoud to Kafr Sarem to connect up two sections ... 7 kiloms.

Besides these there have been many sidings laid and lengthened in all their Provinces.

They have now under construction, and the bridge work completed on four different sections, amounting to about 44 kilometres of new line.

Surveys have been made in all the Provinces for connecting up their system and opening up the Province of Menoufieh more fully, amounting to about 175 kilometres. Detailed plans, etc., for the line in the latter Province have not yet been submitted for approval.

Equipment.—The Company handle a heavy traffic exceedingly well with a shortage in both engines and wagons. The shortage in vehicles would not be felt so much if they had more power to draw the rolling stock. The present types of engines have proved too light and not suitable for the heavy increase of traffic, but they will do for working on new branches where the traffic will be lighter.

The Company is gradually correcting this shortage in equipment, and

12 heavy 25-ton engines

have been received, also the following vehicles:-

5 bogie 1st class carriages
15 , 3rd , , , break vans
60 , wagons

each equal to 2 four wheeled vehicles for purposes of the concession.

These will very largely help to relieve the congested state of the traffic during the heavy cotton season. With no reserve stock the tax upon the equipment has been very great.

Further orders will probably follow for the work of the new extension.

The maintenance of the Company's lines has generally been good especially in Gharbieh and Behera. In the Provinces of Charkieh and Dakahlieh, owing to the faulty construction of the lines, the work of maintenance has been very heavy and a good riding track cannot be looked for without changes in the alignment, extensive surfacing and possibly new surveys being made. The former owners seem to have consistently neglected the work of surfacing.

The Company's list of accidents during the year has somewhat increased. The majority injured were employees and largely due to their own carelessness. I only notice one fatal accident to a passenger: a boy who fell out of a train and was run over.

Les chemins de fer de la Basse Egypte.—The receipts to the end of June, 1903, show an increase of L.E.1,234 over the previous year.

The passenger traffic is exceedingly good, and to this, the increase is largely due.

There was nothing to noticeably affect the traffic in this section unless it was the closing of the markets on account of the plague. A better service between Mansourah and Matarich might still further increase the passenger traffic.

eccipts and expenditures.—	1902	1903
	L.B.	L.E.
Receipts	21,857	23,091
Working expenses	11,150	11,381
Nett receipts	10,707	11,711
Working expenses to gross receipts	51. 0%	47. 696
Receipts per kilom. per week	3.85	4.(4
Expenditure	1.96	2. 0
Passengers carried during 1903	018,344	
Passengers carried during 1902	617,443	
Increase for 1903	50,901	
Goods traffic during 1902	55,008 to	ns en
Goods traffic during 1903	54,642	4
Decrease for 1903	366 to	ons

The Company have not added to their kilometrage of 109.

Equipment.—Their equipment is good and will probably answer for some time to come.

The stock is well maintained and the Company have a good reserve in engine and vehicles. The work on their lines has been better. The maintenance of the banks is with difficulty carried out, as the Company have no sidings into the earth koms. A siding laid to one of these koms should, I think, amply pay for itself, giving a fertilizer to the country, maintaining their banks, and for filling in stagnant pools that surround stations and villages so dangerous to health. There were four accidents during the year one of which was fatal, the others appear to have been through carelessness and the Company do not hold themselves responsible.

Fayoum Light Railway Company.—The receipts of the Company for the year show an increase of L.E. 5,172.345 mill. on the previous year, which is an improvement, but better results would be shown if the lines were more fully connected up. This increase is largely due to a marked development in the Province, the diminishing number of transport camels and donkeys, noticeable after the first year or so wherever light railway lines exist, and the advantages of the system of through-booking with the Egyptian State Railways.

The increase of the working expenses is due to the Company having a more highly paid staff.

Receipts and expenditures .-

	1902	1903
	L.E. M.	L. K. M.
Receipts	12,130 247	18,423 698
Working expenses	11,225 769	13,251 353
Net receipts	904 000	5,173 000
Working expenses to gross receipts	92 1 96	72 %
Annual gross receipts per kilo,	84 584	109 665
Annual working expenses per kilo	78 174	78 887
Annual nett receipts per kilo	6 410	30 788
Katio of goods receipts to coaching	74%	8896
Passengers carried during 1903	478,853	
20 71 1902	439,993	
An increase of	38,860	
Goods truffic during 1903	116,797 tons	
n n 1902	75,550	
	10,000	
An increase of	41.247 tons	

No extensions have been made during the year, the kilometrage remaining at 168.

The maintenance of the lines has improved during the past year. As in other sections in Lower Egypt the location of some of their branches is not good, having many needless curves. This will no doubt be gradually put right when the system is more fully connected and the lines laid so as to thoroughly work the Province.

Two new engines have been added to the Company's stock. The traffic has been handled better, but the train service might be much improved.

No accidents have been reported to passengers.

I have the honour to be, Sir, Your Obedient Servant,

> JAMES A. GUNN. Light Railway Commission.

### NOTE ON TARIFFS FOR LIGHT RAILWAYS, 1904.

The Articles in the Concession touching on the question of tariffs for merchandise will be found in Appendix A of this note.

It will be noticed that the maxima class rates were those of the Egyptian Government Railway at the time Concession was granted. Under Article 37 the Concessioners were allowed to arrange provisionally a classification for submission to the Ministry for approval.

The Companies apparently submitted tariffs or proposals asking for the adoption of rates similar to the Government, which was approved by the Ministry's letter No. 3875 H.H' of the 18th May, 1898, and while approving of this provisionally it was pointed out that it would be preferable if the Companies would carefully examine and ascertain by experience the condition of their traffic before a final decision was given.

Up to April, 1899, the light railways under this sanction apparently worked on tariffs somewhat similar to the Government Railways.

Letters of the 13th and 15th April, 1899, as per annexes, pointed out that the same tariffs should not be applied to light railways as the conditions of traffic were quite different.

The Government, in replying on the 17th April, 1899, No. 1941 decided to give light railways absolute full powers in regard to their tariffs (see this letter), the object being to give the Companies an opportunity to find a suitable tariff and up to this date they have been working in this way, see letter from the Commission of June 26th 1901.

It is obvious from the Concession that the Government's intention was that the Companies should submit tariffs for approval, and that the maximum of each class should not exceed the Egyptian State Railway at the time.

There does not appear as if there was anything laid down requiring the same classification of the State line, and this view is confirmed by the subsequent decision of the Government allowing the Companies full powers to change rates for nearly two years in order that they might find a tariff to suit the conditions of their traffic. Thus it will be seen that the Companies have now had a free hand in the matter of rates for some years and have apparently arrived at a tariff that satisfies the public, as there have been few, if any, complaints.

The classification of the various railways as compared with that of the Government Railways will be found with the Ap, endix, and it will be noticed the classification for many commodities is different in each line, which is no doubt due to the varying conditions of their traffic.

It would be very difficult to arrange a uniform classification that would suit all railways, and the experience of the Companies tends to

show that it would not suit the public in all cases.

The object of uniformity in classification is, I understand, principally to simplify work of through-booking between railways, but in this country all the Companies are worked on the tariff of the Egyptian Railway Administration for through-booking. If the Government classification is required of the light railways, I feel certain the result will be that the Companies would ask special rates for most, if not all, of their commodities and eventually return to their present tariffs.

I therefore beg to propose that the Commission should:

(1) Recommend a maximum for all classes as laid down by the Concession which distinctly provides for this (see Appendix A).

(2) If necessary, to adjust any articles of their tariffs, and approve

of sume not fixing any minima.

(3) That Rule B as recommended by the Commission in December, 1902, be enforced, which is as follows: That the rate between any two points between which the State Railways and the Companies both have lines should not be less than the rate calculated on the tariff of the State Railways for the shorter distance.

(4) That the Companies be allowed to change their rates between the maxima of one class to the maxima of the next class below without applying to the Government, viz: for first class between 15 mill.-10 mill. Second class 10 mill.-7 mill. &c. always notifying the

Government Railway of any change.

Should the Companies want to lower their rates, for example for 1st class below 10 mill. per 10 kiloms., they must apply to the Ministry 30 days ahead for approval.

Should any undue preference be shown, it would no doubt soon be

brought to the notice of the Ministry by the agrieved parties.

This mode of procedure would have the advantage of simplifying the control of the Companies' tariffs.

In going over the Companies' tariffs, it can at once be seen how very varied their classification is, and how impracticable it would be to require a uniform classification for all. With the maxima fixed, and rule B once enforced, it can make no difference what rates the Companies charge.

# AGRICULTURAL RAILWAYS.

art, thus.		Year to which lighten given mier.		Aug. 1902 to   Sept. 1903.	15,384 (July 1902 to	9,520 Lbec. 1903 to
Annual Keport, 1903.	PTB.	Total coaching resmiples.	52.77 - 79 one	74,0%	16,31	9,520
7	RECEDETE.	Average sum paid for ench ticket.	MILL.	80.8	÷ 83.	19-06
		Pakanagara kilomatro of line opened to traffic,		4,512	80.0	6,8550
RECEIPTS.	6 CARRIED.	Tesse T.		3,636,638	068,344	478,853
DETAILS OF COACHING RECEIPTS.	NUMBER OF PASHENOEUS CARRIED.	Third		3,144,619	600,416	468,2103
) do STIV	NUMBER O	Sley urid		1	63,222	1
DET		First		102,069	4,7(8)	788.0
		Average langth of the opened to traffic during 1901.	Kilometres.	Militar N. 5081	K. 102 or M. 685	K. 168 or   M. 105
Table No. I.		Trees of Line		Egyptinn Delta Light Kaliway Company	Mansourub-Naturich	3 Fayoum Agricultural Light Railway Company
	1-	Number.	1	-	≎1	2.2

## AGRICULTURAL RAILWAYS.

1903.	Linen unafter cenatives	Kilom. Millor.	K. 44 or mile, 27	Nome.	. None	1	1
Annual Report, 1903.	Total length of lines Docember 1908.	Kiloma. Milia.	K. SI.S.	K. 109 er mils, 68	K. 168	1000	681
Junue	Length of litter opened during (NE.	Kilennu.	K. 13	N. S.	Z.	13	W.
	Longth of lines opened becomber 1902.	Kiloms.	K, SOL	201 o	168	1078	(12.3
	Weight of with	Kilemp.lon Line p. yd.	15 or 32	23 m 50 lbs.	드 등점	1	1
or WAY.	Gaugo of Imes.	Metres. Ft. ms.	W. 075	M. 1.00 3 3§	M. 075	1	1
PERMANENT	Approxi- inge length of lines mentioned in emensiones	Kaloms. MHes.	K. 514	K. 100	K. 116 M. 91	760	t a
	Etale 1sf		March, May, 1895	June, 1895	May. 1897	The same	1
DETAILS OF	Term of Date of	Y on Pb.	70   March, May, 1896	30 June, 1895	70 May, 1897		1
		Ventra.				Total number of kilometres	
	Term of	Ventra.	02	ĵ,	e :		1

# AGRICULTURAL RAILWAYS.

1908.	Rathe of grands provides to vice hing		11.1.62	I to 1.99	140 139
Annual Report, 1903.	lintio of working expenses to gross muniple.	96		82.03	71.93
muut	Asmuel got recolete per kisan, of Hen.	LK	60°%	—*201	30
	Annual working oxponess par kitom. of line.	L.E.	82.64	104.—	78.
	Total capatall- tere,	L.B.	925,0%	35	13,253
K KIPPS	Gross receipts per kilom. of line including a resty-	<u> </u>	150	31 31	1415
GOODS AND COACHING RECRIPTS	Total grass Pevelple includes cvery thing.	LE	76,968 129,472	23,001	18,423
AND COA	Recolpts fosts conching.	7. 7.	X Sign	5.00 mg	1,720
Goods	Reservative from goods.	1	686.5	202.2	8,5386
	Crocelle corrected.	Tellis.	171.530	54,649	116,797
	Average length of brequenade to traffic during	Kilom. Milee.	K. 806	K. 109	K. 168
Table No. III.	TULE OF LINE.		Egyptian Delta Light Railway Company	Maneourah-Matarieh	Fuyoum Agricultural Light Railwnys
	Summer.	1	-	21	ಪ್



### REPORT

ON THE

## GIZA ZOOLOGICAL GARDEN

For 1903

BY

STANLEY S. FLOWER.

DIRECTOR.



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# REPORT ON THE GIZA ZOOLOGICAL GARDEN FOR 1903.

#### I. STAFF.

CAPTAIN S. S. FLOWER, F.Z.S., M.B.O.U., etc. KAMEL FAHMI EFFENDI. SALEH LEBIB EFFENDL Storekeeper ... . . .

MUSTAFA RI. ANTABLI EFFENDI. Gatekeeper

ISMAIL SOLIMON. BARR AHMED. Head Keeper ...

MOHAMMED EL BRHAIRI. Head Carpenter IBRAHIM EL HAMZAWI. Head Gardener

One Mahout.

Ten Keepers (1st and 2nd class). Ten Keepers (3rd and 4th class).

Three Night-watchmen.

One Artizan.

And a varying number of labourers on daily pay.

Ten Path-sweepers. Three Mosnic-pavement repairers. Four Garden-labourers. Two Leading Gardeners. One Carter. One Tree-cutter. In all, seventy-six men on monthly pay.

The Director left Egypt on leave on 17th May and returned on 27th August, during this period Captain H. G. Lyons, Director General, Survey Department, P.W.D., kindly acted as Director of the Zoological Gardens.

Two Propagators.

Seven Flower-men. Two Mowers.

One Rock-gardener.

Ten Waterers.

#### II. VISITORS AND GATE RECEIPTS.

(i) The number of visitors and amount of gut-money as compared with previous years is shown in the following table:—

YEAH.	Visitors.	EE.	M.M.
1896		481	960
1897	?	766	(550)
1898	?	937	2(31)
1899	43,567	991	950
1900	0.0.19/910	976	130
1901	50,711	1.111	840
1902	47,117	1,037	120
1903	55,937	1.213	420

N.B.—One Egyptian Pound (£E. 1) equals £1, 0s. 6 dd. or 25 frames and 92 centimes.

#### (ii) Visitors, 1908.

	Cham-e) Nessem		Sunta) aft theore	Week days and resolve Machings	i littere ant , bis lens	Nificial a		Nale or	tor)
			Paring P.C. s	Paying P.T. 2	Yasıng P.P. I	almuted from	TOTAL	££.	H.H
January		_	841	4,435	1,371	233	6,883	144	1(4)
February	-	_	1,177	3,008	566	148	4,800	121	670
March	-	-	1.872	5,610	1,398	683	9,563	219	780
April	265	92	758	3,097	tilei	530	5,378	137	3000
May	-	-	426	2,321	553	183	3,483	733	250
June		-	233	2,004	449	154	2,846	56	520
July	-	-	191	1.954	449	288	2,882	53	120
August	_	-	183	1,923	579	139	2,824	53	ALM)
September	-	-	173	2.012	432	148	2,765	53	210
October	-	-	275	2,388	618	395	3,679	117	840
November	-	-	765	1.830	654	388	3,637	81	3(4)
December	-		1.003	4,147	1,536	412	7,098	148	450
Тотан	265	92	7,906	34,729	9,214	3,701	55,937	1,213	420

# III. ALPHABETICAL LIST OF DONORS, AND THEIR DONATIONS DURING 1903.

ADAMS, Mr. Y., Gezira.  1 Parrakeet, Palaornis torquata	25th Jan.
AMSTER, Dr. R., Sanitary Department, Cairo.  1 Kra Monkey, Macaeus cynomolyus	oth June.
ANTHONY, MR. H. M., Ministry of Finance, Cairo.  1 Grivet Monkey, Cercopithucus athiops	19th June.
BEADNELL, MR. H. J. L., Survey Department, P.W.I 1 Desert Fox, Canis famelicus	), 4th Jan.
BUTCHER, Mrs., Church House, Cairo.  2 White Java Sparrows, Munia oryzivora	2nd Oot.
CATTAUI, Mr. GUSTAVE, Cairo.  1 Fox, Canis vulpes	4th June.
CHAWARBI MOHAMMED PASHA, Legislative Council, C	Cairo. 23rd Jan.
COKE, LIEUT. THE HON. E., Rifle Brigade.  1 Leopard, Felis pardus	lst Aug.
CROMER, RIGHT. HON. THE EARL OF, G.C.B., etc., Cain 1 Crowned Crane, Balearica paroning	ro. 14th March.
DIXON BEY, SANIEH F., C.M.Z.S., Port Said  2 Buff-backed Egrets, Ardea ibis  1 Lesser Black-backed Gull, Larus fusus	11th Jan. 17th May.
FLOWER, MRS. S. S., Giza.  1 Hawfinch, Coccothranstos milgaris  1 Skink, Mahnia quinquotemiata  1 Quail, Coturnix communis	19th Feb.

FLOWER, CAPT. S. S., Giza.	
1 Hødgehog, Erinaceus auritus	19th Feb.
HASSAN BEY TAHIR, Cairo.  1 Imperial Eagle, Aquita heliaca	12th April.
HASSAN GAAD, Giza.  1 Weasel, Mustela ajricana	oast Mr. 1
Hewens, Mr. J., Sudan Government Railway, Wadi  1 Patas Monkey, Cercopithecus patas	
HOSAIN HASEEB BEY, "Magalat El Mahalat El Arab 1 Patas Monkey, Cercopithecus patas	eia," Cairo. 10th Nov.
HUMPHREYS, Mr. H. A., Survey Department, P.W.I 7 Leith's Tortoises, Testuto leithi	
INNES BEY, Dr. F. WALTER, M.B.O.U., Kasr el-Aini, 1 Lanner Falcon, Falco feldeggi	Cairo. 1st May.
Ismain Bey Shakoon, Cairo.  2 Newts, Molge cristals	21st Octobe
MAHMUD EFFENDI RASMY, Mulazim Awal, Military S  2 White Storks, Ciconia alba	chool, Caire
MOHARREM BEY ABU GABEL.	
2 Kestrels, Falco tinnunculus	19th Ang.
SEDNAOUI, M. GEORGES, Caisse de la Dette, Cairo.  1 Mare, Equus caballus	14th Nov.
Shelford, Mr. R., c.m.z.s., Sarawak, Borneo.  1 Spinous Terrapin, Geoemyda spinosa	
Sportiswoode, Major A.A., 72nd Scaforth Highland	lers.
1 Grivet Monkey, Corcopithecus athiops	
Talbot, Major General the Hon. Sir Reginald, K.C. 1 Pelican, Pelecanus anoerotalus	C.B.
100 100 100	wind Len.

TANZIM SERVICE, Director-General of, P.W.D.  5 Swans. Cygnus olor 28th	Nov.
Tolba Ibrahim, Ombashi, Giza.  1 But, Rousetius orgyptiacus	March. Oct.
WAKELING, Dr. J. G., Mena House, Giza.  1 Kite, Milvus agyptius 3rd	May.
WALLER, MB. EDWARD, Youzbashi, Alexandria City Pol 1 Monkey, Corcopithecus athiops 27th	Dec.

Besides the above donations, the Gardens also received on the 29th Jan. a Catalogue of Birds of Prey in the Norwich Museum from Mr. J. H. Gurney, Keswick Hall, Norwich, England; on the 19th Feb. a Flamingo from an anonymous donor; on the 11th March two maximum and minimum Thermometers from Herr G. Sässman, Mouski, Cairo, and on the 17th and 19th Dec. several plants from Herr Christian Stamm, Bulue-Dacrour Road, Giza.

Thanks are also due to the following Foreign Institutions for presenting copies of their publications:—

#### Europe.

- Bâle,—Zoologischer Garten in Basel.
   Dr. GOTTFRIED HAGMANN, Direktor.
   (Jahresbericht 1902).
- 2. Dublin.—Royal Zoological Society of Ireland.
  Dr. R. F. Scharff, Ph.D., B.Sc., F.Z.S., Secretary.
  (Seventy-first Annual Report.)
- Hague.—Koninklÿk Zoölogisch Botanisch Genootschap.
   D. N. Dierz, Directeur.
   (Verslag over het jaar 1902).
- Hamburg.—Zoologischen Gesellschaft in Hamburg.
   Dr. Heinhich Bolau, c.M.Z.s., Direktor.
   (Forty-first Annual Report, 1902.)

- Hannover.—Zoologischer Garten.
   Dr. Ernst Schäff, Direktor.
   (Report, 1902-1903).
- Leyden.—Rijks Museum van Natuurlijke Historie te Leiden.

Dr. F. A. Jentine, F.M.Z.S., Director. (Verslag, 1902-1903.)

#### Asia.

- Colombo.—Colombo Museum, Ceylon.
   Dr. A. WILLEY M.A., D.SC., F.Z.S., Director.
   (Spolia Zeylanica, Vol. 1. Parts, 1, 2 & 3.)
- 8. Kuching.—Sarawak Museum, Borneo. R. Shillford, M.A., C.M.Z.S., Curator. (Report for 1901 and 1902).
- 9. Singapore,—Raffles Museum and Library.
  Dr. R. Hanitch, Ph. D., Curator.
  (Report for 1902).
- Taiping.—Perak Museum.
   E. Kellich, Acting Curator.
   (Report for 1902.)
- 11. Trivandrum.—Trivandrum Government Museum and Gardens, Travancore.

  H. S. Ferguson, F.L.S., F.Z.S., Director.

  (Report for M.E. 1077, 1901-1902.)

#### Australia.

12. Adelaide.—South Australian Zoological and Acclimatization Society.

ALFRED C. MINCHIN, Director. (Twenty-fifth Annual Report, 1902-1903.)

#### America.

13. New York.—New York Zoological Society.
W. T. HORNADAY, C.M.Z.S., Director.
(Bulletins, Nos 8, 9, 10 & 11).

Philadelphia.—Zoological Society of Philadelphia.
 ARTHUR ERWIN BROWN, Secretary.
 (Thirty-first Annual Report, 1902-1903.)

#### Africa.

- Pretoria.—Transvani Museum and Zoological Gardens.
   Dr. J. W. B. Gunning, Director.
   (List of Additions to the Zoological Gardens, Aug. 1902 to April 1903.)
- Cape Town.—South African Museum.
   W. L. Schater, M.A., F.Z.S., Director.
   (Report for 1902).

#### IV. BUILDINGS.

- Lion House, built 1901. This house is proving most satisfactory. Six new Turkish Oak sleeping benches for the animals were added, being paid for out of the balance of the Public Debt Commission's Grant given in 1901. Some small repairs were done to the roof and to six of the small carnivora cages.
- Elephant House, built 1900. This house is also most satisfactory.
   The pitch-pine bars of the north interior cage were replaced by teak and paid for out of the balance of the Public Debt Commission's Grant of 1901.
   The north, west and south exterior walls were repainted.
- 3. Tropical House, built 1902. This house appears to answer all its requirements, the heating apparatus works well and is economical of coal. Two glass-sided tanks for water tortoises were provided by the balance of the Public Debt Commission's Grant of 1901. Three strong tables for exhibition tanks were constructed.
- 4. Monkey House.—Originally built about thirty years ago, and not intended for animals; between 1891 and 1896 reconstructed for its present purpose, the authorities in charge at that time did their best, but little money was available and old and inferior materials were employed. By October 1898 the building was in a deplorable state, roof incapable of keeping rain out, eages incapable of keeping monkeys in, it was extremely draughty, owing to the construction of eages, roof and floor, impossible to thoroughly clean or to free from rats. Since 1898 much of the carpenters' and keepers' time has been taken up by constant small repairs, but the condition of the building does not improve. In 1993 the Tanzim Department gave a grant of L.E.25 with which several repairs and small improvements were effected, enabling the building to be still used during the winter of 1903-1904.
- 5. Caracol.—The Ministry of Finance handed over to the Zoological Gardens a piece of land running the whole length of the south side of the Gardens of an area of 1 feddan, 17 kirats, 4 sahm (=1.714 feddans), or 1.779 acres, on the eastern end of which the Caracol stands. This imposing battlemented building erected as a Guard House to Giza Palace in the reign of H.H. the Khedive Ismail Pasha, and till recently used as a police station,

was handed over to the Gardens on the 1st October, 1903, it was altered and restored so that the central portion now forms the south entrance to the Zoological Gardens, and the wings will eventually give accommodation for store-rooms and work-shops.

- 6. New South Wall —A substantial brick wall with an artificial stone coping was built by the Tanzim Department along the southern boundary of the Gardens including the new strip of land mentioned in the last paragraph and replacing the old wooden fence, which was unsatisfactory as failing to keep out either human or four-footed trespassers.
- 7. Elephant Steps.—Owing to the Elephant having grown taller, the steps erected in 1900 for people wishing to ride on his back, were made nearly two feet (60 centimetres) higher, by the Tanzim Department.
- 8. Bear House.—The alterations carried out in 1902 have proved very satisfactory.
- Director's House.—The interior of the Office and dining-room were repainted.
- 10. Hyzena House.—The western exterior eage was repayed with hard Trieste stone laid in cement.
- 11. African and 1899 Aviaries.—These buildings have answered their purpose satisfactorily, but as the collection of birds grows, are becoming too crowded. Three leaks appeared in the tanks of the African Aviary, which were consequently repaired.
- 12. Birds of Prey Cages.—A row of seven old cages in the Haremlik Garden were demolished, and an entirely new cage begun to be built on the site, with a wooden floor raised 29 inches (72 centimetres) off the ground. The interior dimensions of the new cage are approximately:—length 93 feet (28'40 metres), width 11½ feet (3'50 metres,) height 9% feet (3 metres).
- 13. Ibex Enclosure.—The Ibex having several times broken out of their paddock; the fence, which is about 212 yards (194 metres) long was repaired and strengthened.
- 14. Paddocks.—Small repairs and improvements were carried out in the north-western, Central and Selamlik Paddocks.

- 15. New Cages were built for small birds and monkeys near the South Gate and for jackals near the Lion House, and ones for oribi near the Director's House and for alligators near the Citadel Grotto were commenced.
- 16. Garden Seats.—Forty new wooden seats for visitors were put up in various parts of the Gardens.
- 17. Pavements in Haremlik Garden.—The work of repairing the marble and mosaic-work pavements was continued but makes slow progress.
- 18. Paths in Selamlik Garden.—The paths leading to the South Gate were relevelled, sanded, rolled and edged with pieces of Trieste stone set on end to form an irregular "dog tooth" pattern.
- 19. Bridges.—Four of the bridges over the Schmlik Canal were repaired and repainted, work urgently required as nothing had been done to these bridges since they were first erected rather over thirty years ago.
- 20. Labels, etc.—37 new zoological and 3 new botanical labels were painted and put up, and 20 old zoological labels repainted. Two propagating frames for the Nursery Garden, three cupboards, a collapsable travelling cage for antelopes, and two parrot stands were also made by the carpenter.

# V. ANIMALS.

#### (i) Number of Animals alive in Gardens.

	6th (		6th C		6th Oct., 1900		6th Oct., 1901		6th Oct., 1902		6th Oct., 1903	
Mammals.	Speciments	Species.	Specificalian.	Species	Sperialists	Sprine.	Speciment.	Spearen	Aprelmons.	Specim	Spatiatelies.	Specius
Primates	59 25 - 46 1 5	15 12 - - 17 1 3 - 50	56 39 8 2 4 50 1 2 	15 13 1 1 4 14 14 12 51	80 67 2 2 16 82 1 9	19 20 1 1 20 1 6	66 46 3 2 6 81 1 6	19 17 1 2 4 18 1 4	69 66 10 12 25 100 1 4	17 22 1 2 7 25 1 3	4	15 20 2 3 8 24 1 3
	TER		11-				-					
Birds.  Passeres Psittaci Striges Accipitres Steganopodes Herodiones Anseres Columbae Pterocletes Gallinae Fulicariae Aloctorides Limicolae Gaviae Casuarii Struthiones Total Birds	10 16 1 1 24 30 1 38 - - - 2 3	_	55 30 18 24 5 40 30 6 49 1 - 3 2 5 2 6 2 6 4 9 1 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 2 2 2 2 2 2 3 2 3 2 3 2 3 2 3 3 3 4 3 3 3 4 3 3 3 4 3 3 3 4 3 3 3 4 3 3 3 4 3 3 3 3 3 3 3 3 3 3 3 3 3	77 111 8 22 33 111 77 22 111 —————————————————————————	15 6 60 50 7 87 — 4 — 3 2 7	10 -2 -2 -3	17 61 45 23 125 1 125 1 128		74 48 48 15 21 21 21 1177 11 11 12 11 12 11 12 11 12 11 12 11 12 11 12 12		92 33 333 15 30 438 81 15 80 22 44 44 44 47	24 28 1 14 3 8 10 7 1 10 2 3 2 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
Reptiles.  Chelonia Emydosauria Squamata Total, Reptiles  Butrachians			13 2 16 31	1.0	41	17	33		1 4		9 41	11
GRAND TOTAL		98	478	135	670	165	770	179	023	21	959	222

(ii). The following seventy-one species of birds have visited the Gardens of their own accord during the years 1899 to 1903.

1st Species found wild in Egypt.

- 1. Song Thrush, Turdus musicus.
- 2. Blackbird, Turdus merula.
- 3. Redstart, Ruticilla plurnicurus.
- 4. ? Black Redstart, Ruticilla titys.
- 5. Blue-throated Warbler, Cyanecula succica.
- 6. Robin Redbreast, Erythucus rubecidu.
- 7. ? Nightingale, Daulius Iuscinia.
- 8. Subalpine Warbler, Sylvia subalpina,
- 9. Blackcap Wurbler, Sylvia atricapilla.
- 10. Willow Warbler, Phylloscopus trochilus.
- 11. Chiffehaff Warbler, Phylloscopus collybita.
- 12. Olivaceous Warbler, Hypolais pallida.
- 13. Rufous Warbler, Aèdon galactodes.
- 14. Graceful Wren-Warbler, Prinia gracilis.
- 15. ? Nuthatch, Sitta sp.
- 16. White Wagtail, Motacilla alba.
- 17. Grey Wagtail, Motacilla melanope,
- 18. Golden Oriole. Oriolus galbula.
- 19. Masked Shrike, Lanius nulicus.
- 20. Pied Flycatcher, Museicapa atricapilla.
- 21. ? Chimney-Swallow, Hirundo rustira.
- 22. Egyptian Chimney-Shallow, Hirando savigni,
- 23. House-Sparrow, Passer domesticus,
- 24. Chaffineh, Fringilla cerlebs.
- 25. ? Corn-Bunting. Emberica miliaria,
- 26. Cretzschmar's Bunting, Emberiza cavia.
- 27. Short-tord Lark, Calandrella brachydaetyla.
- 28. Hooded Crow, Covens cornix,
- 29. ? Egyptian Nightjar, Caprimulgus agyptius.
- 30. Kingfisher, Alcedo ispida.
- 31. Fied Kingfisher, Ceryle rudis.
- 32. Roller, Coracias garridus.
- 33. Bee-enter, Merops apiaster.
- 34. Ноорое, Прира грорв.
- 35. Southern Little Owl, Athene glaux.
- 36. Burn-Owl, Strix dammea.
- 37. Sparrow-Hawk, Accigniter nisus.
- 38. Peregrine Falcon, Falco peregrinus.
- 39. Kestrel, Falco tinnunculus.

- 40. Egyptian Kite, Mileus agyptius.
- 11. Egyptian Vulture, Neophron percnopterus.
- 42. Pelican, Pelecanus onocrotulus.
- 43. Grey Heron, Ardea cinerea.
- 44. Purple Heron, Ardea purpurea.
- 45. Little Egrot, Ardea yarzetta.
- 46. Night-Heron, Nycticorax griseus.
- 47. White Stork, Cironia alba.
- 48. Spoonbill, Platalva leucorodia.
- 49. Wild Duck, Anas boscas.
- 50. Pintail Duck, Anas acuta,
- 51. Shoveller, Spatula clypeata.
- 52. Teal, Querquedula crecca.
- 53. Tufted Duck, Fuligula cristata.
- 54. ? Red-crested Pochard, Fuligula rufina.
- 55. Pochard, Fuligula ferina,
- 56. White-eyed Duck, Fuligula nyroea.
- 57. Rock-Dove, Columba livia.
- 58. F Turtle-Dove, Turtur auritus,
- 59. Palm Dove, Turtur senegalensis.
- 60. Water-Hen, Gallinula chloropus.
- 61. Coot, Fulica atra.
- 62. ? Demoiselle Crane, Grus rirgo.
- 63. Stone-Curlew, (Edicnomus scolopax.
- 64. Lapwing, Vandlus vulgaris.
- 65. Woodcock, Scolopax rusticola.

At least two more species of Warblers have been seen but not identified, and the European Nightjar, Osprey, Lesser Kestrel and Grey Crane are believed to have occurred. A query has been placed before nine species in the above list as although the identifications are believed to be correct they rest on less certain evidence than the majority of species enumerated.

2nd foreign species which presumably must have escaped from captivity elsewhere in Egypt.

- 1. Red-headed Wenver Bird, Ploceus madagascariensis.
- 2. Striated Fineh, Munia striata.
- 3. Java Sparrow, Munia oryzivora.
- 4. Green Parrakeet, Palavenis tarquata or P. docilis.
- 5. Larger Green Parmkeet, Palwornis up. ?
- 6. Grey-headed Love-bird. Agapornis cana.

A manuscript record has been kept of the dates when each species was noted in the gardens, and of the number of individuals observed, which in most cases are found to be increasing from year to year; the Haremlik Lake is the favourite resort of the wild fowl. 171 Shovellers have been counted there at once, and 360 Night Herons, in 1902 the largest number of Teal counted on the lake at one time was 130, in 1903 it was 171, and on the 25th February 1904, there were 283 Teal there.

The following snakes were caught in the gardens during 1903, all were small and harmless.

- Thirteen Glauconia cairi (6th, 22nd and 27th Feb., 9th. 22nd [five specimens], 23rd and 26th March, 10th April and 1st May); the specimen found on the 6th February was 247 m.m. in length.
- 2. Two Zamenis florulentus (19th April and September).
- 3. ()ne Psammophis sibilans. (11th April).
- 4. Three Tarbophis obtums (4th, 9th and 31st October).

(iii.) Registered additions to the Menagerie :-

			1899	1900	1901	1902	1903
Acquired by presentation	000		98	103	74	103	48
" " purchase			515	209	343	126	300
Bred in the gardens		• • •	27	31	25	64	81
Received on deposit			26	11	27	39	13
Obtained in exchange			5	17	5	6	10
Total	***	• • •	671	371	474	338	461

Of the additions during 1903 the following should be specially mentioned:-

The fine pair of Grevy's Zehras Equus grevyi deposited on the 7th March by the Zoological Society of London to whom they had been presented by Lieut. Col. J. L. Harrington, c.B.,c.v.o., and several additions to the collection of Egyptian birds, including the Little Bittern, Purple Coot, Corn-Crake, Lapwing, etc.

- (iv). The following were bred in the Gardens during 1903 :-
  - 1. Dusky Lemur, Lemur fulrus, 1 (born 6th June).
  - Northern Genet, Genetta calgaris. 2 (born 27th July, died suddenly 26th October).
  - Egyptian Jackal, Canis lupuster. 11 (litter of 4 31st March and one of 7 21st April; none were reared).
  - 4. Cairo Spiny Monse, Acomys cahirinus, numerous.

- Dorcas Gazelle, Gazella dorcas. 7 (of which 4 died before the end of the year).
- 6. Arabian Gazelle, G. arabica. 1 (born 6th Feb. died 8th May).
- 7. Arial, G. sammerringi. 3.
- 8. Angora Goat, Capra hireus var. 1.
- 9. Circassian, Goat, Capra hireus var. 1.
- Ibex, Capra nubiana (pure-bred and hybrids) ! (of which 2 died before end of year).
- 11. Sudan Sheep, Ovis aries var. 2.
- 12. Hedjaz Sheep, Ovis aries var. 4.
- 13. Arui Wild Sheep, Ovis lervia. 1 (born 17th June, died same day).
- Griffon Vulture, Gyps fulvus. 1 (hatched 9th June, died 2nd September).
- Silver Pheasant, Euplocamus nycthemurus. 3 (hatched 1st May, one died 21st September).
- 16. Laughing Dove, Turtur risorius. 16.
- 17. Palm Dove, Turtur senegalensis. 11.
- 18. Central African Dove, Turtur decipiens. 7.

Unless otherwise stated the above were successfully reared, as were also Turkeys, Guinea Pigs, Rabbits, etc.

#### (v) Registered departures from the Menagerie: -

	1899	1900	1901	1902	1903
Sent away from the gardens, for various causes.  Disappeared (mostly small birds).  Killed by wild foxes, cats, rats, etc  Accidental deaths from animals injuring themselves, or each other  Deaths from natural causes	10 27 24 16 233	23 21 21 21 10 194	27 6 20 19 210	88 33 6 16 196	60 23 - 20 235
Total	310	269	282	339	338

No important animals died during the year. The twenty accidental deaths include nine Jackal puppies eaten by their mothers, a Lion cub which choked itself eating a piece of ment, an Angora Goat which fell into a canal and was drowned, and several animals and birds which met their deaths fighting their companions in the same eages.

The disappearances include several ducks which may have been carried off by foxes or wild-cats.

The number of deaths in each month was :-

				-	1889	1900	1901	1902	1903
January February March April May June July Angust September October November December	***	100	 		33 22 11 17 19 14 16 11 14 30 31 15	15 15 15 12 19 18 14 5 11 17 19 34	19 18 11 11 12 13 11 18 21 17 23 26	26 14 18 11 8 12 14 13 12 18 20 30	25 17 8 15 15 18 11 20 21 24 17 44

Of these 235 animals there were:

- 45 monkeys.
- 9 lemurs.
- 45 other mammals.
- 98 birds.
- 38 reptiles.

Thirty-eight of the above died within one month of arriving in the Gardens, and twenty-seven between one and three months of their arrival.

Six of the nine lemurs died of dysentery (ulcerative colitis) between the 11th January and 26th February, one died from the result of an accident, one apparently from old age and the remaining one from unknown causes.

Several of the monkeys died of dysentery about the same time as this disease appeared among the lemurs ; three died of tuberculosis ; others of pneumonia and severe constipation, but as usual in many cases it was impossible to determine the cause of death, all the organs appearing healthy.

- Dr. G. Elliot Smith, Cairo School of Medicine, kindly made postmortem examinations of a large number of the animals that died.
- (vi) A list of the species and varieties of Animals which have been exhibited alive in the Egyptian Government's Zoological Gardens at Giza, from 6th October 1898 to 4th March 1904.

Those species which occur wild in, or are domesticated in, Africa and its adjacent islands, including Madagascar, are marked with an asterisk.

#### Class Mammalia.

#### ORDER PRIMATES.

	Family Simiide.	
1.	Simia satyrus Linnæus	Mins, or Orang Utan.
	Family Cercopithecidse.	
4)	Semnopithecus entellus (Dufresne)	Langur, or Hanuman, Monkey.
3.	obscurus, Reid	Dusky Leaf-Monkey.
4.	14	Purple-faced Monkey.
	Nasalis lurvatus (Wurmb)	Proboscis Monkey.
6.	T1 (7 (8)	Sooty Mangabey.
7.		Grivet Monkey.
8.		Vervet Monkey?
9.	200 0 0 0	Patas Monkey.
10.		Sykes's Monkey.
	Macaeus sinieus (Linneus)	Bonnet Monkey.
12.	(3)	Toque Monkey.
13.	1 /T 1	Kra, or Macaque Monkey.
14.	* FF *	Broh, or Pig-tailed Monkey.
15.		Bandar, or Bengal Monkey.
16	mounts & Christ	Moor Macaque Monkey.
•17		Barbary, or Rock Ape.
	. Cynopithecus niger (Desmarest)	Black Ape of Celebes.
*19	- · · · · · · · · · · · · · · · · · · ·	Arabian, or Sacred Baboon.
*20	and the same of th	Annbis Baboon.
•21		Yellow Baboon.
~ ~		
	Family Cebidse.	
400		White-throated Capuchin
24	. Ceous appoients (Humootte)	Monkey
	Family Lemuridae.	
		Ruffed Lemur.
	3. Lemur varius, Isidare Geoffroy	Black Lemur.
•2	200 8	Van Diak Lame
-2		0 1 T
•2	6, fulrus, E. Geoffroy	( ) 1 T
*2		13.5 - 1-23-J T
	8. " catta, Linnæus	
2	9. Nyeticebus tardigradus (Linnæns)	DIOW LIGHTER

30. Loris gracilis, E. Geoffroy ... Slender Loris.

#### OBDER CARNIVORA.

Family Felide.	
*31. Felis leo, Linnæus	Lion.
32 tigris, Linnæus	Tiger.
*33 pardus, Linnaus	Leopard, or Punther.
*34 serval, Schreber	Serval.
*35. " chaus, Güldenstädt	Jungle Cat.
*36. ,, libyca, Meyer	Fettered Cat.
*37. domestica, Brisson	The Cat.
*38. " caracal, Güldenstüdt	Caracal.
*39. Cynwlurus jubatus (Erxleben)	Chita, or Hunting Leopard
Family Viverridæ.	
*40. Viverra civetta (Schreber)	African Civet-Cat.
*41 malaccensis, J. F. Gmelin	Rasse Civet-Cat.
*42. Genetta vulgaris (Lesson)	Northern Genet.
*43. " senegalensis (Fischer)	Pale Genet.
44. Paradoxurus hermaphroditus (Pallas)	Malay Palm Civet-Cat.
•45. Herpestes ichneumon (Linnæus)	Fgyptian Mongoose.
•46. Crossarchus zebra, Rüppell	Zebra Mongoose.
Family Hyzenidæ.	
•47. Hyuna crocuta (Erxleben)	Spotted Hymna.
•48. " striata, Zimmermann	Striped Hyæna.
Family Canidæ.	
*49. Canis familiaris, Linnæus	The Dog.
50 lupaster, Hemprich & Ehrenberg	Egyptian Jackal.
*51. authus, F. Cuvier, var. souda-	
nicus, Thomas	Sudanese Jackal.
•52 mesomelas, Schreber	Black-backed Jackal.
•53. " vulpes, Linnæus	The Fox.
•54. " famelieus, Cretzschmar	Sand Fox.
•55. " serda, Zimmermann	Fennec Fox.
Family Mustelidæ.	
56. Mustela putorius, Linnœus, var. furo,	10
Linnæus	Ferret.
•57 vulgaris, Erxleben, var. ajri-	Egyptian Weasel.
*58. Ictorya libyca (Hemprich & Ehrenberg)	T :1 Quarter 1 31°
59. Meles taxus (Boddaert)	Badger.
33. Metes taxus ( Doumeter)	

#### Family Ursidae.

- 60. Ursus arctos, Linnaus ... ... Brown Bear.
- 61. Hemprich & Ehrenberg ... Syrian Bear.
- 62. "Pucheran? ... var. piscator, Fishing Bear?
- 63. " malayanus, Raffles ... ... Malay, Sun or Honey Bear.
- 64. Melursus ursinus (Shaw) ... ... Sloth Bear.

#### ORDER INSECTIVORA.

#### Family Erinaceidæ.

\*65. Erinaceus auritus, S. G. Gmelin ... Long-eared Hedgehog.

#### Family Soricidæ.

\*66. Crocidura olivieri (Lesson) ... Olivier's Shrew.

#### ORDER CHIROPTERA.

#### Family Pteropodidæ.

- \*67. Rousettus agyptiacus (E. Geoffroy)... Egyptian Fruit-Bat.
- \*68. .. collaris (Illiger) ... ... Collared Fruit-Bat.

#### Family Rhinolophidæ.

\*69. Rhinolophus antinori, Dobson ... ... Antinori's Horseshoe Bat.

# Family Nycteride.

\*70. Nycteris thebaica, E. Gooffroy ... Theban Long-eared Bat.

# Family Vespertilionidae.

- \*71. Otonycteris hamprichi, Peters ... ... Hemprich's Long-eared Bat.
- °72. Pipistrellus kuhli (Natterer) ... Kahl's Pipistrelle Bat.

#### Family Emballonuridæ.

- \*73. Taphozous audirentris, Cretzschmar. Sheath-tailed Bat.
- \*74. Rhinopoma microphyllum (Brünnich). Long-tailed Bat.
- \*75. Nyctinomus appptiacus, E. Geoffroy. Wrinkled-lipped Bat.

#### ORDER RODENTIA.

### Family Sciuridæ.

76. Sciurus prevosti, Desmarest ... ... Raffles's Squirrel.

#### Family Muridæ.

*77. Gerbillus agyptius, Desmarest	Lesser Egyptian Gerbille.
*78. " pyramidum, Isidore Genfroy	Greater Egyptian Gerbille.
*70. Pachyuromys dupresi, Lataste	Fat-tailed Gerbille.
*80. Mus rattus, Linnsons	The Rat.
*81. " narvegious, Erxleben	Norway Rat.
82. " musculus, Linnæus	The Mouse.
*83. " niloticus (E. Geoffroy)	Nile Rat.
*84. Acomys cahirinus (E. Geoffroy)	Cairo Spiny Mouse.
Family Dipodide.  *85. Dipus jaculus (Linnseus)  *86. " gerboa, Olivier	Lesser Egyptian Jerboa. Greater Egyptian Jerboa.
Family Hystricidæ.  *87. Hystrix cristata, Linnæus	Indian Porcupine.

# Family Caviidse.

90. Cavia porcellus (Linnsens) ... ... Domestic Cavy, Guinea-Pig.

#### Family Leporidae.

\*91. Lepus cuniculus, Linnæus.... The Rabbit.
\*92. .. agyptius, Desmarest? ... Egyptian Hare.

#### ORDER UNGULATA.

African Wild Donkey.

Grevy's Zebra.

# Family Procaviidæ. 93. Procavia sp. incert. ... Egyptian Hyrax. Family Elephantidæ. 94. Elephas indicus, Cuvier ... Indian Elephant. Family Equidæ. 95. Equus caballus, Linnæus ... The Horse. 96. asinus, Linnæus ... The Ass, or Donkey.

Fitzinger ... ... ...

\*98. Equus greeyi, Milne-Edwards ... ...

# Family Bovidae.

I dillity and take	
• 99. Bos taurus Linnsens The Ox.	
100, " indieus " Indian Ox, or Ze	ou.
•101 var.? Nuer Ox.	
102. bubalus Linnæus The Burralo.	
*103. Ourshia montana (Rüppell) Oribi.	
*104 Colors defessa (Rippell) Waterbuck.	
*105. Gazella doreas (Linnseus) Doreas Gazelle.	
"106. " " var. isabellu,	
Gray Isabella Gazello.	
*107. Gazella ptilonura (Henglin)? Von Henglin's	fazelle ?
*108. " rußfrons, Gray Korin Gazelle.	
109. arabica (Hemprich & Bhrenberg) Arabian Gazelle	
110 subgutturosa (Gäldenstädt) Persian Gazene.	
*111 aummerringi (Cretzschmar). Arial, or Aoui.	Di Dook
112. Antilope cervicapra (Linnaus) Indian Anteiope,	
*113. Hippotragus equinus (Desmarest) Roan Antelopo.	
*114. Oryx leucoryx (Pallas) Sahre-horned A	ntetope.
115. Addax vasomaculatus De Blainville) Addax.	
*116. Strepsiceros kudu Gray Greater Kudu.	
*117. Carra hirous Linnous var.? Egyptian Gout.	
•118 Sudanese Goat.	
119 Bernean Goat.	
Angera Geat.	
121 Chreassian Cross	
*122. Capra nubiana F. Cuvier Nubian Ibex.	*** ***
192 Onic grice Linnsens par.? Egyptian "Ball	rowi Sneep.
	an-nosed Sheep.
*195 Hedjaz Black-f	
126. Wau Short-tail	ed Sucep.
127. Ovis lervia (Pallas) Arui, or Barba	ry Wild Sheep.
93	
Family Giraffide.	
•128. Giraffa camelopardalis (Linnsens) Giraffe.	
Family Cervidæ.	
129. Cereus elaphus (Linneus) var. maral	
Grav Persian Red 1	eer.
130. Carvus unicolor Bechstein Sambar, or Ru	isa Deer.
130. Carous unicolor Distaller Spo	

131. " axis Erxleben ... ... Chital, or Spotted Deer.

\*132. .. dama Linnæus ... ... Fallow Deer.

#### Family Tragulidae.

133. Tragulus meminna (Erxleben) ... Indian Mouse Deer.

#### Family Camelidae.

- 134. Lama huanacos (Mol.) ... ... Huanaco, or Wild Lama.
- \*135. Camelus dromedarius Linneus ... Arabian Camel.
- 136. . bactrianus Linnæus... ... Bactrian Camel.

#### Family Suidæ.

- º137. Phacocharus africanus (Graelin) ... Œlian's Wart Hog.
- 138. Sus cristatus Wagner ... ... Asiatic Wild Swine.
- 139. Babirusa alfurus Lesson... ... Babirusa.

#### ORDER EDENTATA.

#### Family Dasypodidæ.

140. Dasypus villosus Desmarest ... ... Hairy Armadillo.

#### Family Orycteropodidæ.

º141. Orycteropus æthiopicus Sundevall... Ethiopian Ant-Bear.

#### ORDER MARSUPIALIA.

#### Family Macropodidm.

- 142. Macropus giganteus Shaw ... Great Kangaroo.
- 143. .. melanops Gould ... Black-faced Kangaroo.
- 144. , robustus Gould... ... Wallaroo.
- 145. .. ualabatus (Less.and Garn.) Black-tailed Wallaby.
- 146. " derbianus (Gray) ... Derbian Wallaby.
- 147. Petrogale penicillata Gray ... Brush-tailed Wallaby.

#### Family Phalangeridæ.

148. Trichosurus vulpecula (Kerr)... ... Australian Opossum or Phalanger.

#### Family Phaseolomyide.

149. Phascolomys mitchelli Owen ... Wombat.

#### Class Aves.

#### ORDER PASSERES.

#### Family Turdidæ.

1. Turdus musicus Linnaus ... ... Song-Thrush.

<ul> <li>2. Monticola sazatilis (Linnsens) Rock Thrush.</li> <li>3. Ruticilla phonicurus (Linnsens) Redstart.</li> <li>4. Daulias luscinia (Linnsens) Nightingale.</li> </ul>
Family Motseillide.  5. Motacilla alba, Linnæus White Wagtail.  6. Anthus trivialis (Linnæus) Tree-Pipit.
Family Pyenonotidee.  7. Pyenonotus xanthopygus (Hemprich & Ehrenberg) Syrian Bulbul.  Family Muscicapidse.
* 8. Muscicapa collaris, Bechstein White-collared Flycatcher.  Family Ploceidee.
9. Estrelda amandava (Linnæns) Amaduvade Finch.  10. "cinerea (Vieillot) Grey Waxbill.  11. "phanicotis, Swainson Cordon Bleu, or Crimson-sared Waxbill.
*12. *** *** *** *** *** *** *** *** *** *
*26. " principalis (Linnæus) Pin-tailed Whydah-hird.  *27. Ploceus madagascariensis (Linnæus) Red-headed Weaver Bird.  28. " baya, Blyth Yellow-headed Weaver Bird.
Family Fringillide.  29. Paroaria cucullata (Latham) Red-crested Cardinal.  *30. Passer domesticus (Linneus) House Sparrow.  *31. Coccothraustes culparis, Pallas Hawfineh.

*32. Ligarinus chloris (Linnæus)	Greenfinch.
*33. Fringilla calebs, Linneus	Chaffineh.
*34. Carduelis elegans, Stophens	Goldfinch.
*35. Chrysomitris spinus (Linnæus)	Siskin.
*36. Serinus canarius (Linnwus)	Canary.
*37. Linota cannabina (Linnwus)	Linnet.
38. Erythrospiza obsoleta (Lichtenstein).	Persian Desert Bullfinch.
*39. Emberiza hortulana, Linnæus	Ortolan Bunting.
Family Sturnidæ.	
*40. Sturnus vulgaris, Linnwus	Starling.
*41. Pastor roseus (Linnæus)	Rose-coloured Starling.
42. Sturnia malabarica (J. F. Gmelin)	Malabar, or Grey-headed Myna-bird.
43 Aeridoth-res tristis (Linumus)	The Myna-bird. Pious Myna-bird.
41. Eulabes religiosa (Linnæus)	rious Myna-mru.
Family Corvidae.	
	Jackdaw.
*45. Corvus monedula, Linneus	Hooded Crow.
*46 cornie, Linnæus	Brown-necked Raven?
*47. ", umbrinus, Sundevall?	Dioan-metand raison.
ORDER PICA	BLK.
	BLÆ.
Family Picidæ.	
Family Picidæ.  48. Dendrocopus pectoralis (Blyth)	Spotted-breasted Pied
Family Picidæ.  48. Dendrocopus pectoralis (Blyth) Family Upupidæ.	Spotted-breasted Pied Woodpecker.
Family Picidæ.  48. Dendrocopus pectoralis (Blyth)	Spotted-breasted Pied Woodpecker.
Family Picidæ.  48. Dendrocopus pectoralis (Blyth) Family Upupidæ.  •49. Upupa epops, Linnæus	Spotted-breasted Pied Woodpecker.
Family Picidæ.  48. Dendrocopus pectoralis (Blyth) Family Upupidæ.  49. Upupa epops, Linnsons Family Coraciidæ.	Spotted-breasted Pied Woodpecker. Hoopee.
Family Picidæ.  48. Dendrocopus pectoralis (Blyth) Family Upupidæ.  •49. Upupa epops, Linnæus	Spotted-breasted Pied Woodpecker. Hoopee.
Family Picidæ.  48. Dendrocopus pectoralis (Blyth) Family Upupidæ.  49. Upupa epops, Linnsons Family Coraciidæ.	Spotted-breasted Pied Woodpecker. Hoopee.
Family Picidæ.  48. Dendrocopus pectoralis (Blyth) Family Upupidæ.  49. Upupa epops, Linnsons Family Coraciidæ.	Spotted-breasted Pied Woodpecker. Hoopee. Raller.
Family Picidæ.  48. Dendrocopus pectoralis (Blyth)  Family Upupidæ.  •49. Upupa epops, Linnæns  Family Coraciidæ.  •50. Coracias garrulus, Linnæns  Order Psit	Spotted-breasted Pied Woodpecker. Hoopee. Raller.
Family Picidæ.  48. Dendrocopus pectoralis (Blyth) Family Upupidæ.  49. Upupa epops, Linnæus Family Coraciidæ.  *50. Coracias garralus, Linnæus	Spotted-breasted Pied Woodpecker.  Hoopoe.  Roller.
Family Picidæ.  48. Dendrocopus pectoralis (Blyth)  Family Upupidæ.  •49. Upupa epops, Linnæns  Family Coraciidæ.  •50. Coracias garrulus, Linnæns  Order Psit	Spotted-breasted Pied Woodpecker.  Hoopee.  Roller.  TACH.
Family Picidæ.  48. Dendrocopus pectoralis (Blyth) Family Upupidæ.  49. Upupa epops, Linnæus Family Coracidæ.  50. Coracias garrulus, Linnæus  ORDER PSIT  Fumily Loriidæ.  51. Eos rubra (J. F. Gmelin)  52. "riciniata (Bechstein)	Spotted-breasted Pied Woodpecker.  Hoopee.  Roller.  TAGI.  Red Lary. Violet-necked Lory.
Family Picidæ.  48. Dendrocopus pectoralis (Blyth)  Family Upupidæ.  49. Upupa epops, Linnæus  Family Coraciidæ.  50. Coracias garrulus, Linnæus  ORDER PSIT  Family Loriidæ.  51. Eos rubra (J. F. Gmelin)  52. "riciniata (Bechstein)  53. Lorius flavo-palliatus (Reichenow)	Spotted-breasted Pied Woodpecker.  Hoopoe.  Roller.  TACI.  Red Lory. Violet-necked Lory. Yellow-backed Lory.
Family Picidæ.  48. Dendrocopus pectoralis (Blyth) Family Upupidæ.  49. Upupa epops, Linnæus Family Coracidæ.  50. Coracias garrulus, Linnæus  ORDER PSIT  Fumily Loriidæ.  51. Eos rubra (J. F. Gmelin)  52. "riciniata (Bechstein)	Spotted-breasted Pied Woodpecker.  Hoopee.  Roller.  TAGI.  Red Lary. Violet-necked Lory. Vellow-backed Lory.
Family Picidæ.  48. Dendrocopus pectoralis (Blyth)  Family Upupidæ.  49. Upupa epops, Linnæus  Family Coraciidæ.  50. Coracias garrulus, Linnæus  ORDER PSIT  Family Loriidæ.  51. Eos rubra (J. F. Gmelin)  52. "riciniata (Bechstein)  53. Lorius flavo-palliatus (Reichenow)	Spotted-breasted Pied Woodpecker.  Hoopee.  Roller.  TACI.  Red Lary. Violet-necked Lory. Yellow-backed Lory.

Fumily Cacatuidse.	
55. Cacatua galerita (Latham)	Greater Sulphur-crested Cockatoo.
56. " alphurea (J. F. Gmelin)	Lesser Sulphur-crested Cockatoo.
57 leadbeateri (Vigors)	Lendbeater's Cockatoo.
58. " ulim (P. L. S. Müller)	Greater White-crested Cockatoo.
59 moluccensis (J. F. Gmelin)	Rose-crested Cockatoo.
60. gymnopis, Selater	Bare-eyed Cockatoo.
61. " dueorpsi, Hombr. & Jacq	Ducorp's Cockatoo.
62. roseicapilla, Vieillot	Roseate Cockaton.
63. Liemetis nasica (Temminek)	Slender-billed Cockatoo.
64 Calopsittucus nove-hollandiar(1.F. Swelin)	Cockateel.
Family Psittacidee.	
65. Ara ararauna (Linnœus)	Blue-and-Yellow Macaw.
66. " macao (Linnæus)	Red-and-Bive Macaw.
67. Conurus nanday (Desmarest)	Black-headed Conure.
68. Chrysotis astiva (Linnaus)	
69. ochrocophata (J. F. Gmelin)	Yellow-fronted Amazon-Parrot.
	b 4 Danuah
70. " rhodocorytha, Salvadori	Red-topped Amazon-Parrot. Salvin's Amazon-Parrot.
71 salvini, Salvadori	
*72. Psittacus erithacus, Linnœus	Gry-Parrot.
*73. Coracopsis vasa (Linneus)	
74. Erlectus roratus (P. L. S. Müller)	. Grand Noble-Parrot. Westerman's Noble-Parrot.
75. " westermani (Bonaparte)	
76. Tanygnathus megalorhynchus Boddart	) Great-billed Parrot.
77. Palaornis torquata (Boddnert)	. Ring-necked Parrakeet,
*78 doeilis (Vieillot)	
79, cyanocephala (Linnœus)	
80. " rosa (Boddaert)	
81. " Jasciata (P. L. S. Müller).	
82. " eupatria (Linnæus)	Large Burmese Parrakeet.
no.	
84. Aprosmictus cyanopygius (Vinillot).	King Parrakeet.
*85. Agapornis cana (J. F. Gmetin)	(Frey-leaded 120ve-bird
On December ( comment	D Dawn koat
Ol. I maperous careman	D P. Domestant
88. barnardi (Latham)	0 mm 9 1
89 multicolor (Tomminck)	D. Lauriana
90. Melopsittacus undulatus (Shuw)	Budgerigar.

#### ORDER STRIGES.

#### Family Strigidæ.

\* 91. Strix flammea Linnsens ... ... Barn-Owl.

#### Family Asionida.

- \* 92. Bubo ascalaphus (Savigny) ... ... Egyptian Eagle-Owl.
- \* 93. Athene glaux (Savigny) ... ... Southern Little Owl.

#### ORDER ACCIPITRES.

#### Family Falconidæ.

• 94. Pandion haliaëtus (Linnseus)	Osprey.
* 95. Circus ærnginosus (Linnæus)	Marsh-Harrier.
• 96. " sucainsoni Smith	Pallid Harrier.
* 97. Buteo desertorum (Daudin)	African Buzzard.
* 98. , ferox (S. G. Gmelin)	Long-legged Buzzard.
* 99. Haliaëtus albicillo (Linnæus)	White-tailed Eagle.
*100. Aquila heliaca Savigny	Imperial Eagle.
*101. " rapax (Temminek)	Tawny Eagle.
"102 maculata (J. F. Gmelin)	Spotted Eagle.
*103. Hiraetus fusciatus (Vieillot)	Bonelli's Eagle.
*104. Accipiter nisus (Linnæus)	Sparrow-Hawk.
*105. Falco peregrinus Tunstall	Peregrine Falcon.
*106 feldeggi Schlegel	Lanner Falcon.
*107 vespertinus Linnœus	Red-legged Falcon.
*108. , tinnunculus Linnæus	Kestrel.
*109 cenchris Naumann	Lesser Kestrel.
*110. Milvus migrans (Boddaert)	Black Kite.
*111. " regyptins (J. F. Gmelin)	Egyptian Kite.
*112. Vultur manachus Linnæns	Cinereous Vulture.
*113. " auricularis Dandin	Sociable Vulture.
*114. Gyps fulvus (J. F. Gmelin)	Griffon Vulture.
*115. " meppelli (Brohm)	Riippell's Vulture.
*116. Neophron percnapterus (Linnæus)	Egyptian Vulture.

# Family Serpentarüdæ.

\*117. Serpentarius gambiensis Ogilby ... Northern Secretary Bird.

#### ORDER STEGANOPODES.

#### Family Pelecanida.

- \*118. Pelecanus onocrotalus Linnwas ... White Pelican.
- \*119. erispus Bruch... ... Dalmatian Pelican.
- 120. .. rufescens J. F. Gmelin ... Red-backed Pelican.

#### Family Phalaerocoracidae.

º121. Phalacrocorax graculus Linnæus ... Shag, or Crested Cormorant.

#### ORDER HERODIONES.

#### Family Ardeidae.

- \*122. Ardea cinerea Linnaus ... ... Grey Horon.
- •123. " purpurea Linuaeus ... Purple Heron.
- \*124. " goliath Cretzschmar ... ... Geliath Heron.
- \*125. " dis Linnœus ... ... Buff-backed Heron.
- \*126. Ardetta minuta (Linnœus) ... Little Bittern.
- •127. Nucticorax griseus (Linnæus) ... Night-Heron.

#### Family Balænicipitidæ.

\*128. Balaniceps rex Gould ... ... Shoebill.

#### Family Ciconiidae.

- \*129. Ciconia alba Bechstein ... ... White Stork.
- \*130. Leptoptilus crumeniferus (Cuvier) ... Marahon Stork.

#### ORDER ANSERES.

#### Family Phoenicopteridae.

\*131. Phonicopterus roseus Pallas ... ... Flamingo.

#### Family Anatidæ.

- \*132. Cygnus olor (J. F. Gmelin) ... ... Mute Swan.
- 133. , atratus Latham ... ... Black Swan.
- \*134. Pleetropterus rueppelli Sclater ... Rüppell's Spur-winged Goose.
- \*135. Cairina moschuta (Linnœus) ... Museovy Duck.
- 136. Æx sponsa (Linnæus) ... ... Summer Duck.
- 137. " galericulata (Linnaus) ... Mandarin Duck.
- \*138. Dendrocygna viduata (Linnous) ... White-faced Tree-Duck.
- \*139. Chenalopes agyptiacus (Linnæus) ... Egyptinn Goose.

7140	Tadorna cornuta (S. G. Ginelin)		Burrow Sheldrake.
*141.	casarea (Linneus)		Ruddy Sheldrake.
*149	Anas boseas Linnieus		Wild Duck, or Mallard.
*143.	strepera Linnæus	111	Gadwall.
°144.	" penelope Linnæus	***	Wigeon.
°145.	acuta Linnæus	+ + 2	Pintail Duck.
*146.	Querquedula creeca (Linnieus)	* * *	The Teal.
*147.	Spatula elypeata (Linnens)		Shoveller.
*148.	Fuligula cristata (Leach)		Tufted Duck.
*149.	" rujina (Pallas)		Red-crested Pochard.
*150.	ferina (Linnæus)		Pochazd, or Dun-Bird.
•151.	Erismaturu leucocephala (Scopoli	)	White-headed Duck.

#### ORDER COLUMBE.

# Family Columbidee.

152.	Columba livia Brisson, var. domestica?	Fantail Pigeon.
•153.		Feather-footed Pigeon.
	Turtur risorius (Linnaus)	Barbary Turtle-Dove.
*155.	vinacous (J. F. Gmelin)	Vinaceous Turtle Dove.
*156.		Central African Dove.
*157.	4 1 17 1	Palm Dove.
	Geopelia striata (Linnæus)	Barred Dove.
159.	(T 42)	Graceful Ground-Dove.
	Œna capensis (Linneus)	Cape Dove.
161	Chalcophaps indica (Linnous)	Green-winged Dove.
101.	Ocyphaps lophotes (Temminek)	/1 1 TI'
102.	Phloganas luzonica (Scopoli)	Blood-breasted Pigeon.
103.	Culmas nicobarica (Linnwas)	Nicobar Pigeon.
10-1.	Culomas medbaried (Limbers)	211000000

# ORDER PTEROCLETES.

# Family Pteroelidæ.

°165.	Pterocles	exustus (Temm	inck)	0 0	Singed Sand-Grouse.
*166.		senegallus (Lin		• •	Spotted Sand-Grouse.

#### ORDER GALLENE.

# Family Phasianide.

167.	Francolinus vulyar	is Stephens		Black Partridge, or	Francolin.
*168.	. erekeli	(Rüppell)	4 6 0	Erckel's Francolin.	
•169.	Coturnix communi	Bonnaterre	• • •	The Quail.	

170	Callipepla californica (Shaw)	Californian Quail.
171	Caccabis chukar (Gray)	Chukur Partridge.
1/1.	Ammoperdix heyi (Temminek)	Hey's Partridge
172.	Plusianus colchicus, Linerus, var. alba.	White Pheasant.
	· Clare	Bar-tailed Pheasant.
174.	ellioti, Swinhoe	Elliot's Pheasant.
175.	m toutie (Loadh)	Lady Amherst's Pheasant.
176.	Thuumalea amherstin (Leadh.)	Silver Pheasant.
177.	Euplocamus nyethemerus (Linneus).	Crested Peafowl.
178.	Pavo cristatus, Linneus	White Peafowl.
179.		- 4-4 9
*180.	Melengris gallopavo, limous, var. dom.	White Turkey.
*181.	er er var. all	West African Guinea-fowl.
*182.	Numida meleogris (Linnans)	
*183	The State of the S	Abyssinian Guinea-fowl.

#### ORDER FULICARLE.

#### Family Rallidæ.

*184.	Porzuna maruetta (Leach)	Spotted Crake.
8145	massar (Sonnoli)	Little Crake.
A 4 4342	Chan mustancia Rashetsin	Land-Rall, or Corn-Cimec.
*187.	Porphyrio madagascariensis (Lathum)	Green-backen Furne Cook.
*188.	Fulica atra, Linnæus	The Coot.

#### ORDER ALECTORIDES.

# Family Gruidæ.

*189.		Grey Crane.
*190.	rirga (Linnæus)	Demoiselle Crane.
*191.	Balogrica paronina (Linnaus)	Crowned Crane.

#### ORDER LIMICOLE.

# Family Edicuemidae.

\*192. (Edicaemus scolopus (S.G. Gmelin) Norfolk Plover, or Stone-Curlew.

# Family Charadriida.

*193.	Vanellus valgaris, Bechstein		Lapwing.	
*194.	Hoploptorus spinosus (Linnieus)	000	Spur-winged	Plover.
•195.	Gallinago gallinula (Linneus)	100	Jack-Snipe.	(1 1 2

\*196. Limosa belgica (J. F. Gmelin) ... Black-tailed Godwit.

#### ORDER GAVIE.

#### Family Laridse.

\*197. Larus fuscus, Linnæus ... ... Lesser Black-backed Gull.
Onder Casuari.

#### Family Casuariidæ.

198. Dromeus nove-hollandie, Vieillot ... Emu.

#### ORDER STRUTBIONES.

#### Family Struthionidæ.

°199. Struthio camelus, Linneus ... ... The Ostrich.

\*200. " molyblophanes, Reichenow... Somali Ostrich. Family Rheidæ.

201. Rheu americana (Vieillot) ... Rhea.

#### Class Reptilia.

#### ORDER CHELONIA.

# Family Testudinide.

	raining restaumance.	
1.	Damonia subtrijuga (Schlegel and	
	Müller).	Siamese Terrapin.
2.	., reeresi (Gray)	Reeves's Terrapin.
3.	var. unicolor Gray?	Black-headed Terrapin?
4.	Bellia crussicollis Gray	Black, or Thick-necked Terrapin,
5.	Emys orbicularis (Linnæus)	Pond Tortoise.
ťž.	Cistudo carolina (Linnæus)	American Box-Tortoise.
7.	Nicoria trijuga (Schweigg.)	Ceylonese Terrapin.
8.	Cyclemys platynota, Gray	Flat-backed Terrapin.
9.	dhor (Gray)	Oldham's Terrapin.
10.	amboinensis (Daud.)	Amboina Box-Tortoise.
11.	Geoemyda spinosa, Gray	Spinous Terrapin.
12.	Testudo tabulata Walbaum	Brazilian Tortoise.
13.	" emys, Schlegel and Müller	Upland Tortois .
14.	calcarata, Schneid	Spurred, or Grooved Tortoise.
15.	pardalis, Bell	Leopard Tortoise.
16.	., radiata, Shaw	Radiated Tortoise.
17.	elephantina, Dum. and Bihr.	Elephantine Tortoise.
18.	elongata, Blyth	Burmese Tortoise.
19.	., marginata, Schoepff	Margined Tortoise.
20.	" leithi, Günther	Leith's Tortoise.
21.	, ibera, Pallas	Algerian Tertoise.

Family Cholonidæ.	12 22 12
• 22. Chelone mydas (lânmens)	Green Turtle.
*23. Thulassochelys caretta (Linnwus)	Loggerhead Turtle.
Family Pelomedusidae.	A 1 Passessin
W. C.	Adanson's Terrapin.
Family ('helydidæ.	T analysis Tortains
25. Chelodina longicollis (Shaw)	1100 B-060 Ked Loreows.
Family Trionychide.	Vilaila Soft Turtle
*26. Prionys triunguis (Forskäl)	"Affille Cott Ymme.
ORDER CROCODE	JA.
Family Crocodilide.	
*27. Crocodilus niloticus, Laur	Nilotic Crocodile.
0.1 .1	East Indian Crocodile.
28. " porosus, Schneid 29. Alligator mississippiensis (Dand.)	Alligator.
OBDER SQUAMA	ra.
Family Geckonide.	
*30. Ptyodactylus hasselquisti (Doundorff).	Fan-footed Geeko.
*31. Hemidaetylus turcicus (Linnæus)	Turkish Gecko.
*32. Taventola annularis (Isidore Geoffroy)	Egyptian Geeko.
Family Agamidae.	The state of the s
*33. Agama mutatilis Merrem	Judge of the Desert.
•34. , pallida Reuss	94 99 99 99
*35. " stellio (Linnæus)	Starred Lizard.
*36. Uromastix appptius (Husselq. & Linn.)	Dab-Lizard.
Family Iguanide.	Horned Lizard.
37. Phrynosoma cornutum (Harlan)	Horned Lazard.
Family Varanidae.	Decart Waren-Liverd.
*38. Varanus griseus (Dand.)	Nilotic Waran-Lizard.
*39. " miloticus (Hassely. & Linn.)	TATION SECTION STATES
Family Lacertide.	Green Lizard.
40. Lacerta viridis (Laur.)	CAECUM LANDON
*41. Acanthodactylus boskianus (Duud.)  *49. scutellatus (Aud.)	Scutellated Lizard.
142. scutettatus (Aun.) 143. Eremias rubropunctata (Lichtenstein)	Red-spotted Lizard.
Family Scincide.	
*11. Mahaia quinquetæniata (Lichtenstein)	Blue-tniled Skink.
*45. Eumoves schnoideri (Dand.)	Schneider's Skink.
45. Scinens officinalis Laur	The Skink.
*47. Chulcides ovellutus (Forskiil)	Ocellated Sand-Skink.
idea (Andrewin)	Audouin's Sand-Skink.
18. " sepance (rincom)	

	Family Chammeleontidae.
*49.	Chameleon valgaris, Dand The Chameleon.
*50.	. basiliseus, Cope Basilisk Chameleon.
	Family (flauconiidæ.
*51.	Glauconia cuiri (Dum. and Bibr.) Cairo Earth-make.
45%	
	Family Boide.
	Boa constrictor Linuxus Boa Constrictor.
*.53.	Erya jaculus (Hasselq and Linneus) Egyptian Sand-Bon.
	Family Colubridae.
*54.	Zamenis floralentus (Is. Geoffroy) Flowered Snake.
	diadema (Schlegel) ('lifford's Snake.
	Lytorhynchus diadema (Dum, and Bibr.) Sand-Snake.
	Tarbophis obtusus (Reuss.) Blunt-nosed Snake.
	Coelopeltis monspessulana (Hermann.) Lacertine Snake.
	moilensis (Reuss.) Moila Snake.
	Psammophis schokari (Forskäl) Schokari Sand-Smake.
*61.	
	Macroprotodon rucullatus (ls. wedleny). Hooded Snake.
(lela	Naia haie (Hasselq and Linnaus) Egyptian Cobra.
	Family Viperidae.
	Family Viperidæ.  Cerastes cipera (Hasselq & Linnæus) Cerastes Viper.
*64.	Family Viperidae.  Cerastes cipera (Hasselq & Linnaus) Cerastes Viper.  cornutus (Hasselq & Linnaus) Horned Cerastes Vipe
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*64. *65. * 1. * 2. * 3.	Family Viperidae.  Cerastes cipera (Hasselq & Linnaus) Cerastes Viper.  Cornutus (Hasselq & Linnaus) Horned Cerastes Vipe  Class Batrachia.  Obder Ecaudata.  Family Ranidae.  Rana massareniensis, (Dum. & Bibr) Frog.  Family Bafonidae.  Bajo regularis, Reuss Square-marked Tond.  Family Hylidae.  Hyla arborea (Linnaus) Tree-Frog.  Order Cardata.  Family Salamandridae.

II. FORAGE.

The following Table shows the nature of find consumed by the animals and its price for each month of 1908.

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	1	Hand, American States of Control	Total

· L.T. Permalie, worth grown is cardens. L.E. Fone milks worth previous of triown in therito.

VII. ACCOUNTS.

Table of Raceipta and Expenditure, under the various heads, during 1903.

Mill.	### ##################################	74:1	087
L.E.	25.25.25.25.25.25.25.25.25.25.25.25.25.2	100	4,614
EXPENDITURE.	1. Salaries 2. Keerling, bedding and fuel for animals 3. Feeding, bedding and extension of buildings and cages 5. Purchase of new animals 6. Printing and stationery 7. Band 8. Sandries (Permanent Advance Account) 9. Library Books 10. Upkeep of Garden 11. Return passage of temporary assistant 12. Extra police, telephone and various	BALANOR CHRUIT	GRAND TOTAL
Mill.	2 1 1 1 2 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5		087
L.E.	25 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		4,614
RECEIPTS.	1. Balance Credit from 1902 2. Government contribution for 1903. 3. Grant from Giza-Gezira Gardens Budget. 5. Grant From P.W.D. for repairs 7. Grate Receipts (29-12-02 to 27-12-03, inclusive) 6. Elephant rides 7. Camel rides 8. Sale of animals, eggs, etc. 9. Fines		Total Receipts

#### VIII. AQUARIUM.

As mentioned in last year's report the Aquarium at Gezica was opened to the public in November 1902.

A credit of L.E.120 was allowed by the Tanzim Service, P.W.D., to the Zoological Gardens for looking after the tanks and fish for the year 1903; but the actual expenditure only came to L.E.74.191 mills.

A list of the kinds of Nile fish which have been exhibited is appended, with some notes on them written up to 5th March, 1904, that may be of interest.

#### FAMILY MORMYBIDE.

## 1. Marcusenius isulori.-Anooma.

This quaint little blunt-nosed fish seems to bear captivity well. Individuals have certainly been ten months, possibly over fourteen months, in Tank No. 11, and are still thriving. There are fifteen or more specimens at present in this tank, each 2 to 3 inches in length. They spend most of their time suspended in mid water, with all their fins and tail in perpetual motion, but occasionally for a short time they will lie on the bottom of the tank with fins motionless. They feed on finely chopped-up earth-worms.

#### 2. Grathomenus cyprinoides,-Anooma.

This species is also doing well in the Aquarium, several individuals have been from ten to fourteen months in Tank No. 21, and others have been recently added. At the present time there are thirteen specimens in the tank, the largest about 10 inches in length. Though in a state of nature their habits are apparently necturnal, in captivity they soon learn to feed by daylight and eagerly devour the finely chopped-up earth-worms on which they are fed daily. They usually keep moving about the bottom of the tank, the pectoral and tail fine being almost constantly in motion, the other fine being only occasionally used.

## 3. Mormyrus kannume.-Ahu boos.

The curious long-decurved nose of this fish at once attracts the attention of all visitors. Over thirty individuals, the largest about 12 inches in length, are living in Tank No. 16, a few of these have been now from eleven to sixteen months in the Aquarium, but the majority have been added early in 1904. From observations made on several specimens kept in the Director's House at Giza we find that naturally they spend the day lying quietly on the bottom of the tank but after nightfall become very active, searching energetically for food. When the light from a match or

lamp falls on them in the dark, their eyes shine very remarkably, sometimes white, sometimes gleaming red. They have a curious habit of swimming backwards with the tail leading. In the Aquarium they som learn to feed by daylight, and it is an interesting sight to see them searching the bottom of the tank, examining every stone and cavity with their long snouts, for the pieces of chopped up earth-worms which are daily put in for them to feed on. Like many other species of fish they fight a great deal among themselves, and several individuals which died, from time to time during 1903, it is believed had been killed by their comrades; but latterly these fights have been less frequent. Like the Greatheneous they prefer the lower part of their tank; the pectoral and tail fins are moved most, but there seems less of the constant waving of fins about this species than there is with the other two Mormyrider mentioned above.

#### FAMILY CLUPBIDA.

4. Clupea finta.-Twait Shad, local name Salmorah.

This Mediterranean fish we know ascends the Nile as far as Cairo in the early months of the year. In the latter hulf of May, 1903, six very small fish caught at the Delta Barrage were purchased for the Aquarium, they apparently belong to this species, and are all still alive in Tank No. 8. They spend the whole day swimming rapidly hither and thither about their tank, moving so continually and quickly that the ordinary visitor to the Aquarium can hardly make out what manner of fish they are. The keepers say they eat bread.

#### FAMILY CHARACINIDE.

5. Hydrocyon forskali.-Kelb-el-Bahr, or Dog of the River.

Of the twenty-six species of fish that have so far been tried in the Aquarium this has been least successful. About eight specimens have been exhibited from time to time, they lived from seven weeks to four mouths, ent freely, appeared in good condition, and then generally died quite suddenly, for what reason has not yet been ascertained; which is curious as a specimen of Hydrocyan brevis, which has apparently similar labits, has done well under similar conditions of captivity. The Kolh-el-Bahr is very active and voracious, feeding only on live fish such as Alestes, which it pursues and captures with lightning-like agility and either swallows whole or bites right in half, swallowing the half seized. It is found necessary to keep a lamp burning near their tanks all night as if left in complete darkness they damage themselves swimming violently against the walls of the tank, but with a glimmer of light they avoid this. There are a few of these fish in the ornamental water of the Sclamlik side of the Zoological Gardens, the largest specimen observed measured

20h inches (52 centimetres) in length overall and weighed 2.6 lbs. (1.2 kilos.); it was taken alive to the Aquarium, 8th April, 1903, but only lived a few months. Although expensive to feed it is a great pity these fish have not so far done better in captivity, as they are very graceful in form and beautiful in colour, silvery bodies with black longitudinal lines and red tail fins; their large teeth which show even when the mouth is closed give them a very ferocious expression which their habits do not belie.

6. Hydrocyon brewis.

Of this rare species only one specimen has been obtained, it was purchased 10th November, 1902, and is still alive (5th March 1904), in Tank No. 17. In habits it resembles *H. forskali*, feeding only on small live fish. It is silvery in colour, with about nine more or less distinct longitudinal black lines on each side of the body, the posterior edge of the tail fin is also black, and the lower lobe of the tail fin red.

7. Alestes kutschyi.-Wri.

Of this beantiful, silvery, salmon-like fish, with a conspicuous red patch on the lower lobe of the tail fin, sixteen individuals which were obtained in October 1902, are living in Tank No. 18; the largest specimen is about nine inches in length. They feed freely on bread daily. They are an active fish, never lying on the bottom of the tank but keeping to mid water or swimming close under the surface. Besides those in the Aquarium there are several in both the Haremlik and Schamlik waters in the Zoological Gardens; the largest specimen noted was 18½ inches (46:3 centimetres) in total length overall and weighed almost 2 lbs. (2 kilos.). When the Esbekin Lake, Cairo, was emptied 12th September 1903 two specimens of Wri were found each measured 21½ inches (55:24 centimetres) in total length overall and weighed 3:85 lbs. (1:75 kilos.).

8. Alestex nurse. - Sardeona.

This is a deeper fish than the Wri, with sometimes a dark spot on either side of the tail. Three specimens were purchased in the Autumn of 1902, and are still alive; one in Tank No. 18 is about five inches in total length, and in Tank No. 9 there are two smaller ones, these latter have grown very considerably during their life in the Aquarium. They resemble the Wri in habits, and are fed on small pieces of bread.

## FAMILY CYPRISHER.

9. Labeo viloticus !- Berbis.

This is an inconspicuous, small, durk-coloured species of Carp, which keeps chiefly to the bottom and sides of the tanks and is fond of hiding away in crevices; it is fed on broad. Four individuals were obtained 7th August 1902, two more 5th November 1902, and two about 15th April 1903; it is believed they are all still alive in Tanks Nos. 2 and 24.

10. Laben forskali.

Another small Carp of similar habits to the last species, from which it is distinguished by the high falcate dorsal fin and very lumpy nose. A specimen purchased in the autumn of 1902 is still alive in Tank No. 2, and is apparently growing in size.

11. Labeo horie !- Libees.

This fine Carp seems to be one of the commonest fishes in the neighbourhood of Cairo, and attains a large size. Large specimens transferred to the Aquarium have, as was perhaps to be expected, not done well, developing a white fungus-like growth on their scales and over their eyes, but young individuals do well and increase rapidly in size, feeding on bread. Having had to be occassionally shift of from one tank to another, as the tanks were required for other purposes, it is not certain how long any individual Libees has lived in captivity, but some now thriving in Tank No. 24 have certainly been in the Aquarium over a year. This species occurs in both the Haremlik and Selamlik waters in the Zoological Gardens; a specimen caught 8th April 1903, was 25 inches (63:5 centimetres) in total length overall, and weighed 6.17 lbs. (2.8 kilos.), and one caught 3rd September 1902 whose length was, unfortunately, not recorded weighed 825 lbs. (375 kilos.). In emptying the Esbekin Lake, 12th September 1903, many specimens were found; the largest was 244 inches (62°32 centimetres) in total length overall and weighed 7°3 lbs. (3°3 kilos).

#### 12. Barbus bynni.-Bynni.

The Egyptian Barbel does well in captivity. Five specimens lived in the Aquarium from 26th December 1901 to 1st January 1903 (one year and five days) when they were accidentally killed by the tank running dry during the night. More specimens were obtained, 7th to 13th January 1903, which are now alive in Tank No. 24; they are fed on bread. In emptying the Citadel Pond in the Zoological Gardens, 29th March 1903, only two Bynni were found, the larger of these measured 11½ inches (29°2 centimetres) in total length overall, and weighed 0°55 lbs. (0°25 kilos.); but when the Esbekia Lake was emptied, 12th September 1903, a large number of Bynni were caught, four of the finest specimens measured:

Total length overall	Weight
25 inches (63.5 centis.)	9'26 lbs. (4'25 kilos.)
264 inches (67.3 centis.)	9'91 lbs. (4'5 kilos.)
254 inches (64.7 centis.)	11 lbs (5' kilos.)
26 inches (66 centis.)	12:35 lbs. (5:6 kilos.)

This last fish Mr. G. A. Boulenger refers to in "The Field," No 2653, of 31st Oct. 1903, as being the largest of its kind on record.

15. Barbus perince.

This Barbel seems only to attain a length of about three inches, and is conspicuous by the black spots on each side of the silvery body: there appear to be usually three of these spots, sometimes two or four, and rarely as many as seven. It does well in captivity either in a small class bowl or in a large aquarium tank, feeding readily on bread-crumbs, biscuits, etc. The numerous specimens in Tank No. 9 were caught in August 1902. There are also individuals in No. 24 and other tanks, in one or two of which it is believed this species bred (and the young fish grew up) in the summer of 1903, as it does in Solamlik canal of the Zoological Gardens.

#### FAMILY SHURIDÆ.

14. Clarius lazera.—Armout.

Two specimens caught in the reservoir of the (fiza Water Works, 26th December 1901 are still alive (5th March 1904) in tank No. 23, and are each about twenty-three inches in length; and in Tank No. 11 there are about twenty-four specimens, from about ten to sixteen inches in length, purchased in August 1902. These fishes are fed on raw meat, and eat large quantities of it; after a meal the distended stomach quite alters the general appearance and shape of the fish. With a sufficiency of food a crowd of individuals will live amicably together, but hunger leads to internecine warfare.

A species of Clarias, either C. lazera or C. anguillaris occurs in the Schamlik Canal of the Zoological Gardens, on the 23rd Sept. 1903 four small specimens were caught, one of which was placed in No. 23 Tank but has not been seen since; on the 21st February 1904 a specimen was found dead, choked by a Synodontis schal which it had attempted to swallow, this Clarias measured 45½ inches (115 metres) in length and weighed 22 lbs. (10 kilos.), and on 22nd February 1904 another specimen was found dead which measured 48½ inches (123 metres) in length and weighed 22 lbs. (103 kilos).

15. Eutropius sp.

The specimens of this fish in Tank No. 6 have not been seen for several months.

16. Schilbe mystus.—Schil Bayer.

17. Siloranodon auritus.- Widanah.

There are several specimens of these two species in Tank No. 6 where they have lived over a year and appear to have increased considerably in size; they are fed on bread.

18. Bayrus bayad.—Bayad.

Although of curious appearance, on account of its extremely long "whiskers," the Bayad seems of little exhibition value, the smaller specimens

spend the whole day completely hidden in the crevices of the rock-work of the tanks, and the larger ones, unable to hide away, lie motionless hour after hour; they have not been observed to eat, but it is found that raw ment placed in their tank over night disappears before morning; large specimens have lived over ten months in the Aquarium, and of the five small specimens now in Tank No. 4 about three have probably been there considerably over a year. When the Esbekin Lake was emptied, 12th Sept. 1903, many Bayad were found, one of the finest specimens measured 26 inches (66 centis.) in total length without including the tails filiments, and weighed just over 6 lbs. (2.75 kilos.)

19. Chrysichthys auratus.—Abu Rial.

In Tank No. 18 there are about seven individuals who have been there since the latter part of 1902, they spend the whole day completely hidden in the crevices of the rock-work except when they are fed when they come out into the daylight, eagerly eat pieces of bread, and then retire again completely out of sight.

20. Synadontis schol.—Schall.

This thick-set blackish fish with armoured head and feeler-bestudded mouth is very numerous near Cairo; it is armed with three terrible spines, one on the dorsal fin and one on each pectoral fin, which give many bad wounds to men working in the water with bare feet and hands. About fifty specimens, varying from 2 or 3 to 13 inches in length from nose to fringe of tail-fin are living in Tank No. 15, some of these have been in the Aquarium certaintly since August 1902 and probably since March 1902. At first it was found that the smaller specimens worried and injured the larger ones by eating their skin, especially about the dorsal fin, but for some months now this has stopped, the supply of artificial food being probably better regulated. The Schall are fed on bread and meat.

Many Schall were found in the Esbekia Lake when it was emptied 12th Sept. 1903, the largest specimen measured 15½ inches (3936 centis.) from nose to extreme end of tail-fin and weighed 166 lbs. (75 kilos.) Equally large specimens have been found in the Zoological Gardens, where this species lives in both the Haremlik and Schamlik waters.\*

21. Malopterurus electricus.—Rna-Ard.

An Electrical Fish purchased 24th November 1902, only lived three months and four days in the Aquarium having died 28th February 1903, In April 1903, two more were purchased and placed in Tank No. 22, where they are still alive and apparently in good health (5th March 1904). Two more have recently (February and March 1904) been received and placed in Tank No. 12. These fish appear to spend nearly the whole day lying

N.B. On the 7th March 1904 an Albino Schall, about 7 inches long, was purchased; a beautiful fish, white all over with pink shades, and black eyes.

motionless on the bottom of the tank, from time to time flapping their pectoral fins. Both the Director and some of the keepers having received strong electrical shocks from comparatively small fish of this species kept at the Director's House; they have not cared to experience how powerful a shock the large fish in Tank No. 22 may be able to give.

## FAMILY MURENIDA.

22. Anguilla culgaris!-Taban samak.

Five Eels eaught at Giza in March 1902 were placed in Tank No. 1, and eleven more added during the summer of 1902. One or two can generally be seen in this tank, but whether the whole sixteen are still alive is not known, as the rockery in the tank affords them numerous places for concealment.

## FAMILY SEBBANIDE.

23. Lates nilations.-Ishr, or Great Nile Perch.

In the last months of 1901 and earlier part of 1902 when experiments were being made in keeping the Nile fish in captivity this species appeared to be the most difficult of all to manage. Large specimens caught and put in the Aquarium tanks, although they would feed, would only live a few days or weeks; but when in the early autumn of 1902 the young Lates of the year appeared in the Selamlik Canal of the Zoological Gardens several were caught and taken to the Aquarium, where some flourished and grew rapidly in size while others completely vanished and there is little doubt they were eaten by their brethren.

There are now (5th March 1904) in the Aquarium in Tank No. 5 one very small Ishr, in No. 7 one medium-sized specimen caught in the Esbekia Lake 12th September 1903, in No. 20 four young individuals the largest about 10½ inches in total length, one at least of these has been in this tank since October 1902, and in Tank No. 24 there is also one small appointment.

Their natural food appears to be live fish only, but it is found they will eat freshly dead fish, such as Alestes, thrown into the tanks, seizing them as they sink and swallowing them whole. One of the most noticeable points about the Ishr is its gleaming eyes, which in some lights glow red like dull signal lamps; another is its power of rapidly changing its colour, and the appearance and disappearance of dark markings all over the sides of the body—further observations are wanted concerning when and how this is carried out.

As is well known this species attains to a great size, but it is surprising how large it grows in quite small pieces of water. It occurs in both the Haremlik and Schamlik waters of the Zoological Gardens. On the morning of 3rd February 1904, after a very cold night, a specimen was found dead

in the Lotus Lake which measured in total length 43 inches (1°114 metres) and weighed 36°37 lbs. (16°5 kilog.). On the 12th September 1902 when the Esbekin Lake was emptied many small and medium-sized *Lates* were caught and one monster who measured in a straight line from point of lower jaw to end of tail fin 48 inches (1°219 metres) and weighed 55 lbs. (25 kilos).

## FAMILY CICHLIDA.

24. Tilapia nilatica.-Bolti.

This Perch-like fish lives very well in captivity in anything from a wide-necked glass bottle to a large tank; it ents readily insects, meat, bread, hiscuit and various plants, and large specimens probably eat small live fish also, in fact anything they can get. Different from most fish, large specimens newly caught and placed in the Aquarium will do well; a Bolti of the largest size caught at Giza 16th March 1902 lived ten months and twelve days in Tank No. 1, dying then probably nor from the results of captivity but from cold. The Bolti is very susceptible to a fall of temperature, both in the Aquarium tanks and in the ponds of the Gardens a sudden spell of cold weather kills large numbers, and after even one degree of frost at night hundreds of these fish are found dead in the canals. This winter therefore Tank No. 1 was protected by glass to prevent the cold air reaching the surface of the water, which consequently maintained a slightly higher temperature than it would have otherwise done and the fish did much better. The largest specimen noted from the Zoological Gardens was 16 inches (40% centim.) in length and 418 lbs. (19 kilog.) in weight, and from the Esbekia 17 f inches (43'8 centim.) and 3'85 lbs. (1'75 kilog.).

## FAMILY TETRODOSTIDE.

25. Tetrodon jahaka.-Fahaka.

In Tank No. 10 there is a Globe Fish that was caught 21st July 1902, so has now been over one year and seven months in captivity and is still thriving; this specimen will not allow any other fish to share its tank, attacking them fiercely. In Tank No. 19 there are three smaller specimens obtained respectively on 21st October 1902, 10th November 1902 and 6th January 1904. They are fed on raw meat.

As du ing 1902, Mr. G. A. Boulenger, F.R.S., of the British Museum, and Mr. W. L.S. Loat, Intely Inspector of Nile Fish, kindly gave information on many points concerning the above fish.

Besides the Nile Fish specimens of Gold-fish Cavassius auratus are also exhibited. In tank No. 13 there are about nineteen ordinary sized specimens which were purchased in November 1901, and also one large individual which was caught in the Esbekia Lake, 12th Sept. 1903, and is about eleven inches in length and very fat.

Some fresh-water crabs caught in the Nile have also been placed in the Aquarium, but owing to their retiring habits are seldom seen, but at least one individual it is certain has lived over a year there and is believed to be still in Tank No. 13; Dr. J. G. de Man has kindly identified this species as Potamon (Parathelphusa) niloticum, H. M.-E. A species of Shrimp found in the Nile has also been exhibited and specimens sent to Dr. de Man.

# IX.-APPENDIX.

A. The following report on the butterflies occurring in the Zoological Cardens has been kindly written by Mr. Philip P. Graves, of Cairo.

# List of Butterflies taken or observed in the Giza Zoological Gardens.

## FAMILY PIERIDE.

- 1. Pieris raper.-Common in all months.
- 2. Euchlee belomia.—End November to April. Occasionally enters Gardens from neighbouring fields. Food plant Mustard. Eruca, and other Cruciferæ.
- 3. Colius adusa.—Most months of the year. Occasionally common in the Gardens. Food plant. Various kinds of clover.

# FAMILY NYMPHALIDE

- Pyrameis atalanta.—"The neighbourhood of the Zoological Gardens seems to be the chief stronghold of this fine species in Cairo. It is far more common at Alexandria.
- 5. Pyrameis cardui.—†Always abundant and swarms in autumn. Food plant. Thistles.
- 6. Danais chrysippus.—This fine butterfly is very abundant at all sensons in the Zoological Gardens. It is a variable species and I have heard that the form with white posterior wings Danais var. alcippus has been seen there.

# FAMILY LYCENIDE.

- 7. Hypolycema livia.—I feel a little doubt about including this species since, when in flight, No. 8 may be mistaken for it. I have however seen it in all the chief gardens in Cairo E. of the River and at Zeitun, etc. The Larva feeds on the "Sünt" Acacia and on Acacia farnesiana, boring into the pods whose seeds and pith it devours. Occurs from early summer to November.
- S. Lampides boticus.—Common in summer and often occurs in the winter months. Food plant. Veteles and Collutea.
- 9. Lampides telicanus.—Summer and autumn. Very abundant August and September. Food plant. Vetches and Albagi manniferum.

<sup>&</sup>quot;"Red Admiral". †"Painted Lady."

 Chilades trochilus.—One male seen. A local species about Cairo occurring in spring and from August to October.

11. Lycena lysimon.— \*Abundant throughout the year except January and February.

#### FAMILY HESPERIDÆ.

12. Parnara mathias,—Common in spring, summer and autumn. This species has a habit of summing itself on the hotiest stones in rockeries and on pathways. Female oviposits on grasses.

I think it highly probable that Parnara nostradamus, a common species in the Barrage and Ezbekia Gardens, and Lampides theophrastus are also

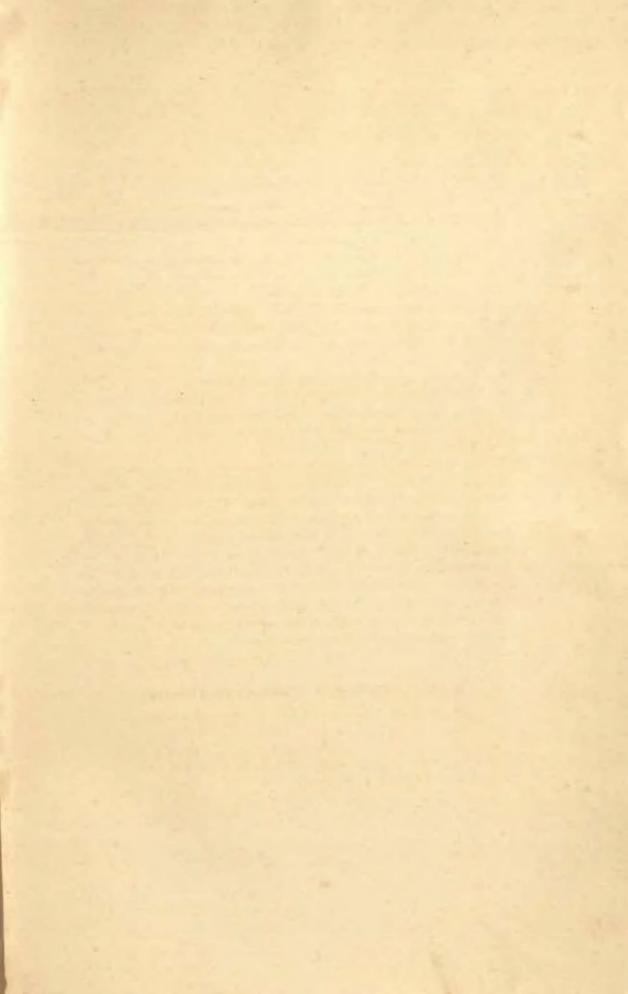
to be taken in the Giza Zoological Gardens.

The small number of species in the above list would be remarkable in any country but Egypt. The absence of woods and of waste ground covered with vegetation and the very thorough cultivation and flooding of the fields accounts for this paucity. Of the 12 species given in the above list 9 certainly oviposit on common crop plants or weeds of cultivation. Thus far I have taken or observed 20 species in the neighbourhood of Cairoincluding Marg and Helwan. Two of these-Hypolycena livia and Lampides theophrastus are East African and Arabian species, though the latter extends in the west to Andalusia. Two-Melitra var deserticola and Lycona allardi-have only been recorded previously from the interior of Algeria and Morocco. Pieris glanconome is a desert species ranging from the Sinai and the Persian Gulf to Shendi or further and the remainder are wide-spread Mediterranean or Cosmopolitan species without exception. Thus, omitting the better-known forms, Parnara mathias ranges from Cyprus to Malaya. Lycana lysimon from Andalusia and the Riviera to India, and Ch. trochilus from the Balkans to North Australia. The Maryut District and the "Wadis" of the Arabian and perhaps the Lybian desert seen to me the most promising localities for the collector, and it would be most interesting to know at what point in Upper Egypt the desert butterflies of the Sudan begin to occur.

P.P. Graves. 27th Nov., 1903.

# B.-List of Publication of the Zoological Gardens.

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